The British Journal of Tuberculosis

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EDITORIAL

PHYSICIAN AND SURGEON TOO

Some years ago surgery was so often followed by sepsis that operations on joints or the abdominal cavity were fraught with such danger that they were very rarely performed. Medicine was not actually dangerous, and although credit was given to certain remedies, such as decoction of toad's blood, its chief success lay in the avoidance of any harmful treatment and leaving the patient at rest until nature had effected a cure.

Later surgery forged rapidly ahead, and it became possible to remove the gall bladder or open the knee joint in safety. The abdomen, once a stronghold of the physician, passed into the hands of the surgeon, and soon the appendices removed in any one year would, if placed end to end, have reached from Land's End to John o' Groats. It then became the turn of medicine to advance, and in rapid succession followed insulin, fresh knowledge about blood and blood-forming organs and resulting liver treatment, the improved treatment of syphilis and many other advances.

During this time the surgeon was concentrating on the chest. Not content with draining an empyema or the Wilm's operation, the technique of thoracoplasty became improved until now the most extensive operation can be performed in stages without undue risk and with comparatively little shock to the patient. Thoracoplasty is not a good operation, and although to-day it is the best method we have of dealing with certain conditions, and has undoubtedly saved many lives, it is difficult to believe that this mutilating procedure will not at some future date be succeeded by a better method of treatment.

But it is not only to the chest wall that the surgeon has turned his attention. Lobectomy is now a commonplace operation, and even the whole lung can be removed in comparative safety. Whatever may be said of thoracoplasty there can be no doubt that lobectomy is a procedure which has come to stay. To remove the diseased portion of lung is clearly an ideal method in the treatment of chronic abscess, bronchiectasis, or new growth. It seems unlikely, however, that the operation will ever be of real value in the treatment of tuberculosis. Experience shows that rest and simple medical means are more effective than the knife in dealing with tuberculosis, and even in the case of so-called surgical tuberculosis operative intervention is becoming less and less common and giving way to rest and other medical methods.

It is interesting to consider the future of the thoracic surgeon. The technique is becoming more and more complicated, and there are only a few surgeons who after years of practice and experience become really competent in this very specialised branch of surgery. Although surgical methods are used increasingly at the special chest hospitals, there is still very little chest surgery at the ordinary general hospital, so that the amount of material available is not great and the number of patients who can afford to pay adequately for a serious thoracic operation is very limited. It would seem, therefore, that there is not a large field for the thoracic surgeon. He is becoming more and more medically minded, and it is possible that in future the chest will become the specialised field of the surgeon and physician in the same way that both medical and surgical diseases of the eye are dealt with by the oculist, and a gynæcologist deals with all sides of the work in his particular branch. Already in parts of the Continent surgical and medical treatment of the chest is carried out by the same clinician, and there is certainly a good deal to be said for abolishing the distinction between medical and surgical work in chest diseases and having a thoracic specialist prepared to deal with both sides of the work.

GENERAL ARTICLES

THE TECHNIQUE OF THORACOPLASTY

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M.D., M.CH. (CANTAB), F.R.C.S. (ENG.)

THE technique of an operation cannot be regarded as satisfactory unless the results are successful in a large majority of the cases. Although, for instance, lobectomy is among the most recent of the newer methods of treatment, the technique can already be claimed to be satisfactory in that fairly consistently good results are obtained in properly selected cases, especially in children.

Thoracoplasty, on the other hand, has been in vogue for a much longer period, but the same claim cannot justifiably be made for it. The proportion of cases in which a cavity has not been completely obliterated or the infection eradicated is still too high. The absence of consistent success has resulted in many and frequent variations in the technique, and also in amplification of the operation, such as, for instance, the freeing of the apex of the lung as suggested by Semb.

Two years ago I had to admit the unpleasant fact that the results of my thoracoplastic operations during the preceding three or four years were less good than they had been in the early period of 1912 to 1915 and in the later period of 1922 to 1930. In the first of these years I had done the Wilms operation and then the Sauerbruch paravertebral thoracoplasty, the latter being a one-stage ten-rib resection. This same technique was also used in 1922 and the ensuing years.

One great difference was, however, in the type of case selected. The disease was more frequently of the productive type without extensive cavitation. In every case, however, the patient had failed to respond to a long course of sanatorium treatment and the disease was progressive. That the technique was suitable for that type of case is shown by the excellence of the collapse, and more still by the fact that of four cases operated on in 1922, three are still alive and working.

With the change in type of tuberculosis, with the increase in cavity formation, and the more extended use of thoracoplasty for the collapse of large cavities, the original Sauerbruch technique was no longer so efficient. Endeavour was made to obtain a more complete collapse by increasing the extent of the rib resection; the whole of the first and second ribs were excised, the greater part of the third and long lengths of the succeeding ribs. The operation was more severe and had to be done in two or three stages. The striking fact that presented itself, however, was that the collapse was often less good than with the original very much shorter rib resections.

In certain American clinics this more extensive resection was carried out to its ultimate degree by the removal in a series of stages of the whole of each of the ribs, and at times the transverse processes as well. I have not, however, been satisfied that even this very drastic excision is achieving sufficiently consistent success to encourage me to such a radical decostalisation.

In the original Sauerbruch operation the approximation of the cut ends of the ribs and the downward displacement of the posterior cut ends played a comparatively small part in the collapse. The essential factor was the bucket-handle rotation of the remaining part of the ribs. This was accompanied by, and could only take place as a result of, torsion of the costal cartilages. When a rib is cut close to the cartilage, this cartilage cannot alter its position; it remains as a rigid projection. Torsion will only take place if there is a strong force exerted on it; the longer, therefore, the length of rib left after excision of a segment at the vertebral end, the greater the leverage that can be applied to the cartilage. While, therefore, in the Sauerbruch operation the bucket-handle rotation of the ribs was the essential factor in the production of collapse, it became progressively less so the greater the length of rib excised, as in the more modern thoracoplasties.

With this principle in mind I again, in June, 1935, modified my technique, and I endeavoured to find the maximum amount of rib resection necessary to retain efficient leverage on the costal cartilage and yet to allow the cut ends of the ribs the fullest space for approximation. I find it to be 10 to 12 cm. The tendency of cavities to become displaced into the sulcus between the transverse processes and the mediastinum, and to prevent thereby complete collapse, led me to the excision also of the transverse processes from the second downwards.

Two big difficulties presented themselves. One was a dropping of the blood pressure and an increase in the pulse-rate which occurred with startling suddenness when dealing with the neck of the second rib and transverse process. This was always disturbing and occasionally alarming. It was found to be due to irritation of the inferior cervical sympathetic ganglion,

PLATE I

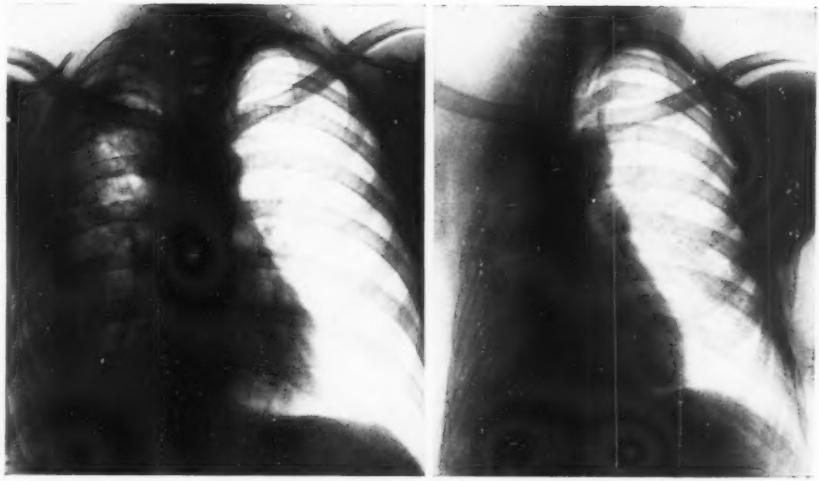

FIG. 1.—E. B.: MULTIPLE CAVITATION.
Right-hand X-ray taken six weeks after two-stage thoracoplasty. Scoliosis uncorrected.

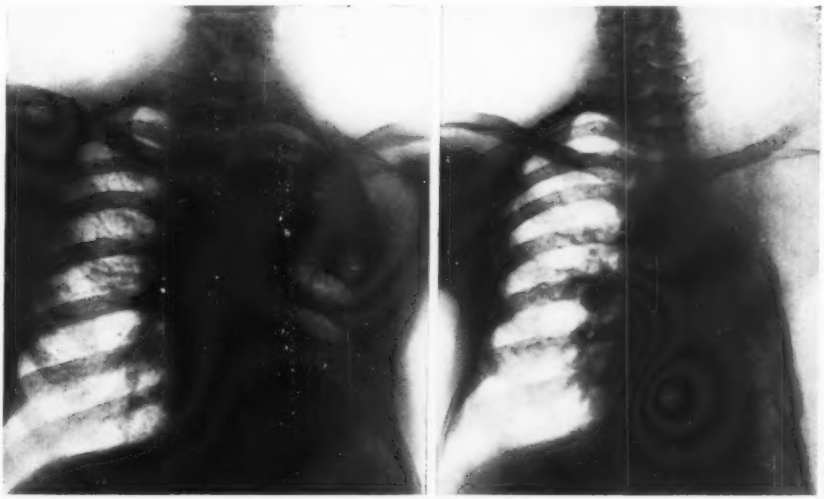

FIG. 2.—W. H.: CHRONIC UPPER LOBE CAVITY.
Right-hand X-ray taken six weeks after two-stage thoracoplasty. Over-correction of original scoliosis prevented by postural treatment.

[*To face page 4*

PLATE II

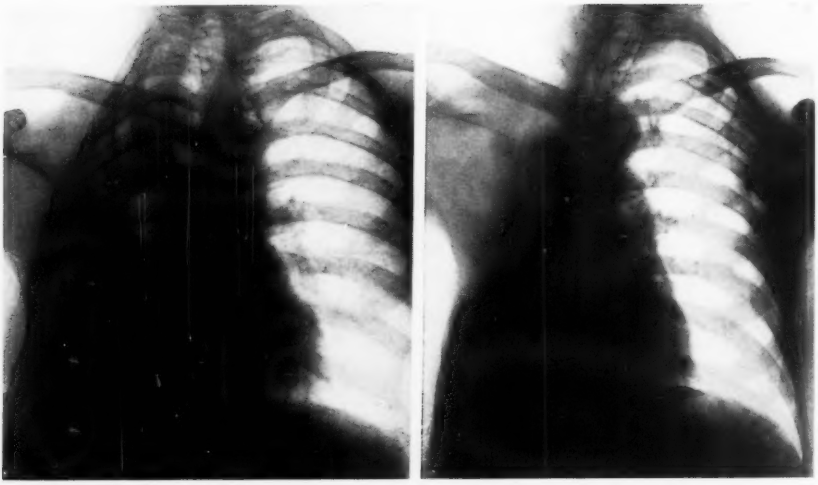

FIG. 3.—C. H.: CHRONIC EMPYEMA CURED BY THORACOPLASTY.
Scoliosis uncorrected.

To face page 5]

and that it could be absolutely cut out by injecting the ganglion with kerocain.* The second difficulty was the tendency for the development during convalescence of a kypho-scoliosis. Further reference to this will be made later.

The patient is anæsthetised by evipan and a minimal amount of chloroform vapour.† Kerocain is rapidly injected into the ribs and into the intercostal spaces after these have been exposed. The scapula is freed by the division of the attachments of the serratus magnus muscle and displaced outwards. The second rib is then excised from the transverse process to the costal cartilage. Access to the cervical ganglion can now be obtained and it is carefully injected with 1 per cent. kerocain. The first rib is then excised as far forwards as the cartilage, and then some 10 to 12 cm. of the third and fourth ribs, according to the size of the chest. Finally, the transverse processes of the second, third and fourth vertebræ and the necks of the ribs are cut away. The wound is closed with drainage.

At the second stage, done three weeks later, 10 to 12 cm. of the fifth to eighth ribs inclusive and the corresponding transverse processes are excised. The ninth and tenth ribs are dealt with similarly in another three weeks.

The number of ribs removed at the successive stages is often modified, depending on the general condition of the patient, the size of the cavities and the amount of sputum. For instance, three ribs only may be dealt with at the first stage, four and three ribs being excised at the ensuing ones. On the other hand, if there is very little or no sputum, the operation is done in two stages of five ribs.

The after-treatment is of great importance, as this is directed from the outset to encourage the bucket-handle collapse and later to correcting the spinal curvature. A sorbo pad is placed in the axilla on the side of the operation, and over this two elastic straps 1½ inches broad are stretched, being kept in place and under tension by strapping pinned at either end of the elastic and fixed to the skin. This elastic tension is maintained continuously until the wound of the final operation is healed, when the special belt is fitted. This belt, which also exerts constant tension by means of elastic webbing, is worn until all the cut ribs have become reunited to the spine by new bone formation.

When I first started excising the transverse processes I had not realised how great a tendency there would be to spinal curvature. This curvature is most marked in the upper dorsal region. It consists chiefly of a scoliosis,

* This has been described in the fullest detail by F. R. Edwards in his paper which appears on p. 7.

† I have tried the various other anæsthetics, but still find that chloroform, which I have always advocated, is the most satisfactory.

convex to the side of the operation. This is due, of course, to the separation of the attachments of the erector spinæ muscles from the ribs and the transverse processes and to the unopposed overaction of the corresponding muscles on the sound side. This overaction is more easily effective because of the loss of the controlling force of the interosseous ligaments as a result of the resection of the transverse processes.

As soon as the stitches have been taken out, the patient is encouraged to lie on the side of the operation with a couple of firm pillows under the chest and a thin one only under the head. As the patient gets used to the position it can be tolerated for longer periods and more frequently. After a time it may be possible for him to sleep the greater part of the night in this position. This correction treatment must be persevered with until regeneration of bone does away with the possibility of the deformity occurring.

In addition to the scoliosis there is also a very definite tendency to a kyphosis in the upper dorsal and lower cervical region. This can be prevented by taking care that the head and neck are not pushed forwards by the pillows.

The illustrations* show the extent of the collapse obtained by this technique. The following consecutive group of eight cavity cases completed this year at High Carley Sanatorium indicate also that the technique is effective:

	No. of Stages.	*Sputum.*			
		Amount in Drachms.		*T.B.*	
		Before.	*After.*	*Before.*	*After.*
E. C.	2	0	0		
M. S.	3	20	2	+	−
N. L.	2	2	2	+	−
V. B.	3	24	1	+	−
A. B.	3	20	1	+	−
M. G.	2	1	0	+	−
Mrs. B.	3	12	4	+	−
Mrs. S.	3	8	0	+	−

* From cases treated at Welsh National Memorial Sanatorium.

A PRELIMINARY NOTE ON SYMPATHETIC SHOCK IN THORACOPLASTY

By F. RONALD EDWARDS,
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THERE is always the possibility that a radical change of technique in an operation may produce some unsuspected phenomenon or complication.

This is particularly liable to happen when the operation is in regions where experience is as yet comparatively small. Such has been the case in connection with the operation of thoracoplasty.

In the clinics of Mr. Morriston Davies shock had not been a feature of thoracoplasty operations that called for any particular comment. But a year ago a change in technique was introduced which included the excision of the necks of the ribs, together with the corresponding transverse processes.

During the first stage of the operation it was noticed that the exposure and removal of the transverse process of the second dorsal vertebra was in some cases and to a varying degree followed by an unusual form of shock, rather different from the classical surgical shock.

This phenomenon was particularly liable to develop when bleeding occurred from the large venous plexus in that neighbourhood where the intra-spinal and extra-spinal plexuses anastomose.

If difficulty was experienced in picking up the vessel, necessitating much probing of the tissues in that region, the shock became even more pronounced.

The amount of blood lost was negligible and could not account for the sudden onset of symptoms.

The symptoms of this particular type of shock have the following characteristics:

Most striking is the suddenness of the onset. In the course of two to three minutes the patient is in a condition of extreme collapse. The pulse becomes rapid and of poor volume, the systolic blood pressure falls down to 70 to 60 mm. of mercury, and the diastolic pressure down to 50 to 40 mm. of mercury.

The breathing becomes shallow, the patient may sweat profusely, and a cyanotic tinge appear in the face and lips.

Fig. 1 shows a blood-pressure pulse-rate graph taken during a first stage thoracoplasty which demonstrates this phenomenon.

The possibility that the symptoms might be associated with a change in the method of anæsthesia was canvassed. Previously the routine method consisted of premedication with nembutal. The field of operation was anæsthetised by a local and regional injection of novocain. The patient was then given sufficient chloroform vapour to render him unconscious.

Latterly evipan has been used in place of nembutal. Whilst the regional injection of novocain was still continued, it was felt that the extreme

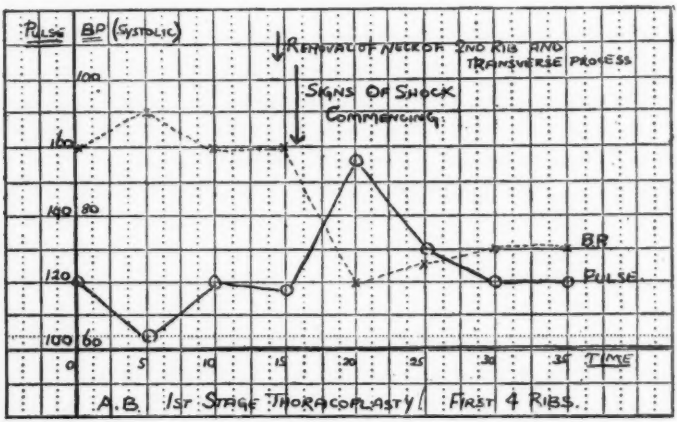

Fig. 1.—Blood-Pressure Pulse-Rate Chart showing the Onset of Shock after the Removal of the Neck of the Second Rib and Transverse Process.

meticulous thoroughness was no longer essential. Our more recent knowledge shows the fallacy of this.

A search for the possible causative factor of the train of symptoms under consideration leads one to consider the possibility of injury to the inferior cervical ganglion and of the dorsal sympathetic chain.

Anatomy and Physiology of the Inferior Cervical Ganglion.

The inferior cervical ganglion and upper two dorsal ganglia of the sympathetic chain are in direct relation to the anterior surfaces of the necks of the first and second ribs.

Many branches can be seen passing from these ganglia to the brachial plexus and large vessels. The most important groups, however, pass down to the cardiac and pulmonary plexuses.

The sympathetic inflow to the thoracic branches is from the third and

fourth dorsal segments of the cord, rami passing to the third and fourth dorsal sympathetic ganglia and so up to the higher ganglia, from which the outflow mainly takes place.

Much variation is seen in the grouping and level of the inferior cervical ganglion and of the upper two dorsal ganglia, as has been fully described by Woollard.

Sometimes the ganglia are combined to form the stellate ganglion, such as is found in the dog, or they may be completely separated (Figs. 2, 3 and 4).

The practical point is that these three ganglia may occupy any position from just above the neck of the first rib to the upper border of the third rib.

Stimulation of the sympathetic group of nerves to the cardiac plexus results in a rapidly increased heart-rate, and in some cases, as has been shown by Rothberger and Winterberger,[1] a definite paroxysmal tachycardia takes place. If the latter condition takes place, the blood pressure falls rapidly, due to incomplete emptying of the ventricle, and the patient attains a state closely resembling shock.

Crile and many others have shown by their animal experiments that stimulation of the sympathetic nervous system can produce a condition identical with surgical shock.

During the operation, stimulation of the sympathetic is easily produced by the periosteal elevators as they are clearing the heads of the ribs and the transverse processes. This stimulation is liable to be increased by the probing with artery forceps in the endeavour to pick up an elusive bleeding point, the sympathetic chain being only separated from this area by the anterior layer of the periosteum of the ribs.

A consideration of these points leads one to surmise that if the inferior cervical and upper two dorsal ganglia and the sympathetic chain were infiltrated with novocain during the operation, sympathetic stimulation would be abolished and shock from this cause eliminated.

Technique of the Injection.

It is difficult accurately to locate the sympathetic ganglia with a needle until the ribs are exposed, but as shock does not appear until after this procedure, the infiltration can be delayed to this stage.

A fine needle is passed into the first intercostal space at the level of the neck of the ribs and passed upwards and forwards until it lies just in front of the neck of the first rib; 3 c.c. of 1 per cent. novocain are injected. A similar procedure is performed in the second intercostal space (Fig. 5).

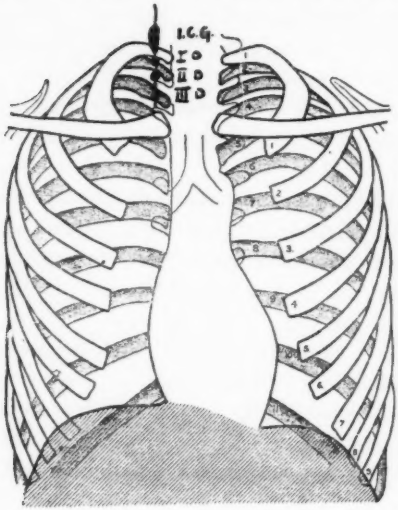

FIG. 2.

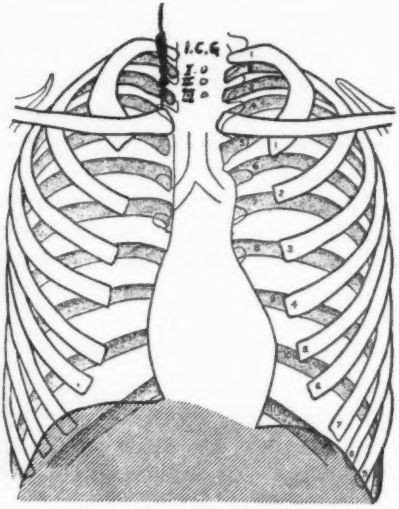

FIG. 3.

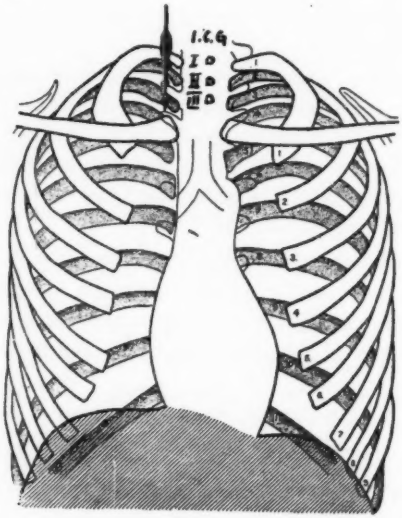

FIG. 4.

FIGS. 2, 3 AND 4.—DIAGRAMS SHOWING THE VARIOUS POSITIONS OF THE INFERIOR CERVICAL GANGLION AND THE UPPER DORSAL SYMPATHETIC GANGLIA.

Fig. 2 : The high position of the inferior cervical ganglion with separation of the first dorsal ganglion.

Fig. 3 : The low position of the inferior cervical ganglion with fusion of the first and second dorsal ganglia.

Fig. 4 : The medium position of the inferior dorsal ganglion with fusion with the first dorsal ganglion; the formation of the stellate ganglion.

The decostalisation and removal of the heads and transverse processes then proceeds as before.

The number of cases on which the anæsthetisation of the sympathetic has been employed is as yet small (only ten), yet it was seen that the sudden fall of blood pressure and rise of pulse-rate did not occur, and signs of shock were absent. Typical blood-pressure pulse-rate graphs are shown (Figs. 6 and 7).

The results have been sufficiently impressive to make one feel that this procedure is of definite value in the operation.

The patient's condition at the termination of the first stage no longer gives cause for anxiety. The first stage can, however, when desired, be

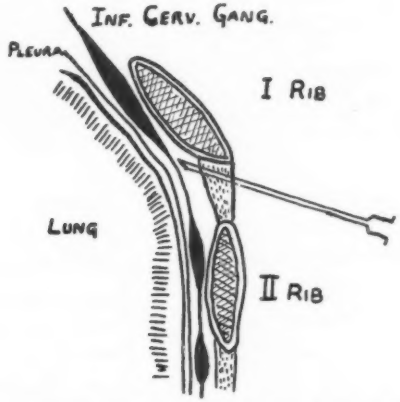

FIG. 5.—DIAGRAM SHOWING THE INJECTION OF THE SYMPATHETIC CHAIN WITH NOVOCAIN.

increased to the removal of five ribs and the corresponding transverse processes, and in such cases the whole procedure can be finished in two stages.

Summary.

Shock produced during thoracoplasty is most severe in procedures involving the posterior ends of the first, second, and third ribs and the transverse processes.

The type of shock is unusual, very rapid in onset, and due to stimulation of the sympathetic nervous system.

Infiltration with novocain of the inferior cervical ganglion and of the upper dorsal sympathetic chain prevents the onset of shock.

Further work is proceeding.

I would like to offer my very grateful thanks to Mr. Morriston Davies for his great help and interest in this work, and to Dr. John Halton for his

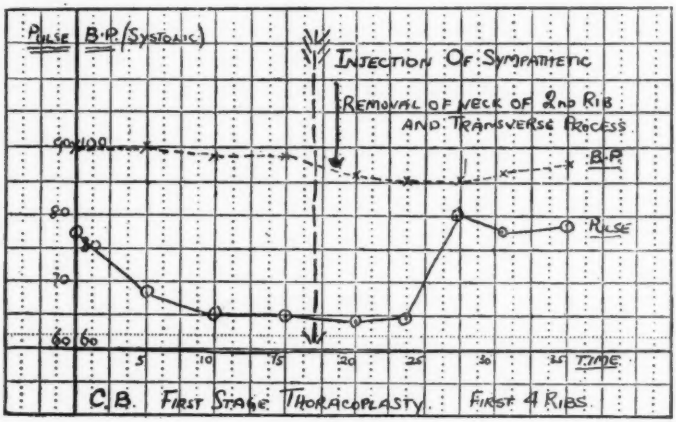

FIG. 6.

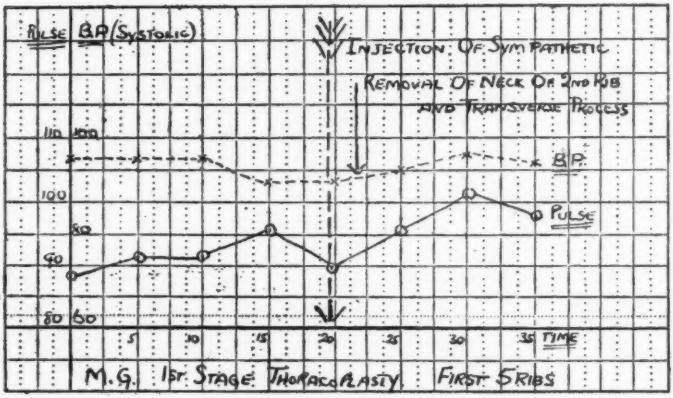

FIG. 7.

FIGS. 6 AND 7.—BLOOD-PRESSURE PULSE-RATE CHARTS SHOWING THE ABSENCE OF SHOCK AFTER THE INJECTION OF THE SYMPATHETIC CHAIN WITH NOVOCAIN IN TWO CASES OF THORACOPLASTY.

very careful blood-pressure readings taken during the course of the thoracoplasties and advice.

REFERENCE.

1. ROTHBERGER AND WINTERBERGER: *Pflüg. Archiv*, 1910-11, xciii. 461.

SURGERY IN THE CLOSURE OF TUBERCULOUS LUNG CAVITIES

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When reviewing surgery in connection with collapse therapy it is generally recognised that such a term excludes artificial pneumothorax with its subsidiary aids, such as thoracoscopy with division of adhesions.

The dangers that may arise from the persistence of cavities in the lung are well known, and as long as the cavities remain open the patient and those around him cannot be considered as immune from infection. There are a certain number of phthisical cases whose symptoms are negligible and whose general condition is most satisfactory, yet they are the possessors of very chronic cavities of long standing. It may well be argued that on their history these people have little to fear, since their immunity has presumably reached a high level; also that to submit them to surgery would be unnecessary and even detrimental to the present state. A most potent argument against conservative treatment lies in the possible persistence of tubercle bacilli in the sputum—a source of infection to others even though the patient himself be immune to their influence. Clearly it is a question in which every aspect of the case must be considered. There is the social side, when the effects on the community at large must be weighed up, and there is the future of the individual case. The most enthusiastic advocate of closure of cavities would hesitate to suggest major surgery in an elderly patient who is in comparatively good health.

The ideal to aim at is closure of all open cavities, but this achievement is bounded by two obvious factors, the type and extent of the disease and the general condition of the patient. As regards the actual treatment there is no doubt but that the simplicity of control and elasticity of artificial pneumothorax makes it the best at our disposal. In addition, thoracoscopy for the dividing of suitable adhesions is a measure that cannot be underestimated, but here only the surgical closure of these cavities is being dealt with, and this, generally speaking, is only to be considered when artificial pneumothorax has failed on account of the pleural adhesions, obliterative

pleurisy, infection and so on. Thoracoplasty is the basis on which all forms of major collapse are based, and in recent years there is a tendency to try and imitate the selective collapse that may be obtained in some pneumothorax cases by performing a modified thoracoplasty over the diseased area. On the other hand, the more extensive cases are better served with the standard total paravertebral thoracoplasty that has produced so many good results.

Total thoracoplasty has certain limitations imposed by the relative severity of the operation and by the condition of the opposite lung. Strictly speaking this lung should be entirely free from disease, and it is a matter of individual judgment as to how much disease can be safely allowed in this so-called healthy side. The presence of any exudative lesion is a definite contra-indication, but a limited amount of apical fibrosis does not necessarily preclude operation. The main fact to be emphasised about a total thoracoplasty is that it is irrevocable, and should the patient develop a spread in the "healthy" lung the margin of safety is dangerously reduced. Yet these risks have to be taken, since in addition to the dangers arising from open cavities there is no purpose in leaving a thoroughly diseased lung in an uncollapsed state in the hope that some functioning tissue may be preserved.

Total thoracoplasty thus accounts for a certain important group of cases—namely, those in which the disease is unilateral and more or less extensive in addition to being chronic. Other cases that can be treated by surgery can be considered in two groups: those in which the cavitation surrounding disease is very localised, and those in which the disease on the opposite side is either too extensive or too acute to allow of total collapse of the worse side. A common example of this latter is a case in which the bulk of the disease with one or more apical cavities is confined to the upper zone of one lung, but in which there may be some fibrosis on the side. For these there is the possibility of producing a localised collapse and even of allowing bilateral partial relaxation. When considering bilateral apical disease or large single apical cavities it is important that the patients should have been under prolonged and careful observation to ensure that the chances of operation on a patient with an active exudative lesion are minimised.

The most satisfactory measure for obtaining localised surgical collapse is *partial thoracoplasty*, though there are several technical variations to be considered. In addition to rib resection two other operations should be mentioned, *extra-pleural pneumolysis* and *phrenicectomy*, the latter requiring special consideration on account of the frequency with which it is employed and the divergent opinions that are held as regards its efficacy.

The problem that any form of partial thoracoplasty has to face is that of obtaining closure of a large rigid-walled cavity situated in the apical region. The standard paravertebral rib resection obtains its collapse by

reducing the transverse or lateral section of the underlying lung. A certain amount of reduction in the vertical and antero-posterior axis is obtained, but the general effect is to compress or collapse the cavity from side to side so that in X-ray it looks like a vertical slit or a pear-drop. If the cavity fails to close, no amount of supplementary rib resection, anterior or lateral, will free the lung from its central or mediastinal attachment. To overcome this difficulty modifications have been introduced with the idea of actually freeing the pleural dome and upper part of the mediastinum, as well as to increase the collapse in the paravertebral gutter.

It would be as well to tabulate some of the various forms of apical thoracoplasties that can be used to illustrate their respective merits and disadvantages.

Apical thoracoplasty, following the principle of the usual paravertebral rib resection, had the occasional disadvantages that have been mentioned. It is important, however, to remove the whole of the upper two ribs, the first in particular. The dissection is extensive and not always easy, but with care both the upper two ribs can be divided anteriorly through their cartilage. Long lengths of the third rib and below this according to the requirements of the cavity are resected.

Extra-fascial apicolysis with thoracoplasty, as introduced by Semb and Holst, aims at dividing all the attachments of the pleural dome so as to mobilise the apex in addition to the rib resection already described. This scheme allows the periosteo-intercostal muscle bands to fall down on the lungs, and as they are freed from the scalene and serratus magnus muscles, beyond the periosteal limit of the ribs, any bony regeneration that may result occurs in the position of maximum collapse of the lung. To enhance the retraction in the paravertebral gutter the rib is freed from its corresponding transverse process and the neck of the rib removed just distal to its head. The operation is termed extra-fascial, since it is performed *outside* the plane of the endothoracic fascia and is designed as a detailed and deliberate operation under local anæsthesia.

Extra-pleural pneumolysis with thoracoplasty is closely allied to the former operation, only the apicolysis is performed *in* the plane of the endothoracic fascia. As an operation it is more simple, consisting of a manual or blunt separation of fused pleural layers from the deep surfaces of the ribs, and after part of one rib, usually the third, has been resected, the freeing of the mediastinal surface is usually surprisingly easy, and when the whole apex has been freed and depressed, removal of the upper two ribs is facilitated by the fact that the deep surface of the bones is completely exposed. The disadvantage of the procedure, if nothing more is done, is that as the collection of serum in the dead space under the scapula absorbs the lung expands

again. To overcome this one end of the periosteo-muscular bundles, either anteriorly or posteriorly, can be divided and sewn lower down over the apex in the form of a rough grid. When periosteal regeneration occurs, the lung apex cannot ascend beyond this level.

The main criticism that can be levelled against this form of operation is that, owing to trauma, the post-operative reaction is more severe than in the straightforward rib resection, and also the increased liability to infection must be borne in mind.

Excision of transverse processes has been advocated so as to increase the degree of collapse in the paravertebral gutter. This involves considerable interference with the erector spinæ muscles and a degree of shock which is out of proportion to the advantage gained. The most serious result affecting the muscle attachments is the production of a severe scoliosis in the later stages.

It should be noted in any form of apical collapse that the extent of the resection is such that not more than three or four ribs should be removed at one sitting. A further point to make is that the collapse is made sufficiently extensive so that the lowest limit of the operation comes well below the level of the diseased lung, and it is customary to grade the operation by removing short lengths of the lower rib or two ribs to prevent there being too sharp a shelf between the collapsed and uncollapsed zones. It must also be ensured that the inferior angle of the scapula does not catch on this shelf made by the projection of the untouched ribs. In practice it is rarely found that a resection of anything under five to six ribs is adequate, though the lengths removed from the lowest two ribs may be small. Failure to collapse enough of the upper lobe may result in a stiff-walled cavity being pushed down the narrow tunnel of collapsed chest wall like a marble into healthy lung, where it persists.

The choice of operation, as distinct from the extent, is a matter which cannot be arbitrarily laid down. It depends on many factors—the situation of the cavity in the apex, whether anterior or posterior, lateral or mesial, whether single or multiple, and hard or soft walled. What can be stated is that if the mediastinum is pulled towards the side of the cavity, and if the ribs are lying more vertically placed than on the opposite side, giving rise to a narrower hemithorax, then any form of thoracoplasty is in the happy position of completing what nature has already started.

Plombierung (*Extra-pleural Pneumolysis with Wax Implantation*).—It is easy enough to produce a localised collapse over a cavity by making a space in the plane of the endothoracic fascia, between the ribs and pleural layers fused over the lung, but it is quite another matter to maintain this collapse, and the unpopularity of the operation is the result of having failed

to find an ideal filling medium. Muscle and fat grafts have not proved themselves successful, and paraffin wax is more commonly employed. Wax is easy to work and forms an efficient " plombe," but it remains a foreign body, and often after a period (two to six months) starts to extrude itself. The operation is reserved for cases with localised or very rigid cavities and in those patients whose general condition precludes a major rib resection; also for bilateral cases in which it is hoped that the collapse or even compression obtained by the " plombe " will allow of sufficient improvement to enable a more permanent operation to be done. If the wax implantation is done from in front, it leaves the posterior field intact for some form of thoracoplasty should occasion arise. When inserted posteriorly, some rib has to be removed if a sinus develops, which is admittedly less common than with the anterior operation, though the chances of performing a subsequent formal rib resection operation may have to be indefinitely postponed.

Phrenicectomy is the last partial operation to be considered. It stands in the peculiar position of having a very variable effect, and in spite of its frequent practice it is open to much criticism. It is, however, the most simple and least damaging of all chest operations.

In the closure of mid and lower zone cavities phrenicectomy has an excellent influence, but when compared with apical lesions the proportion of cases suitable in this respect is very small. Another undisputed rôle is in artificial pneumothorax treatment either to relax adherent basal adhesions or to prevent later traction on healed lung tissue, when the lung is allowed to expand on abandoning an artificial pneumothorax.

With regard to the relationship of diaphragmatic paralysis and any one of the partial thoracoplasties described, there are two diametrically opposed views as to whether it should be employed or not as a preliminary. In favour of performing the operation the risk of aspiration is cited. Supposing that a mass of pus and secretions is forced out of a collapsing cavity and a strong inspiratory movement with sudden descent of the diaphragm occurs, the risk of aspirating a mass of infected material into the lower lobe is a possibility. Further, the performance of the operation may result in apical cavities gaining some relaxation in the vertical axis and allow a certain reduction in the size of the main operation.

The opposite view is based on the fact that the integrity of the diaphragm is essential for effective coughing. Expulsion of inhaled secretions is obtained by the violent ascent of the diaphragm against the force of the chest wall and mediastinum. A paralysed, and therefore immobile or paradoxically moving, diaphragm is thus a potential source of danger, allowing bronchogenic infection in the lower lobe.

In many cases on which apical operations are practised the practical

side of the problem is already solved by a phrenic avulsion having been performed some time in the earlier course of treatment. But the tendency for temporary phrenic nerve interruption by crushing gives the surgeon a chance to wait for regeneration of the nerve before embarking on a thoracoplasty.

The number of bilateral cases that have been submitted to operation is small, but when the use of artificial pneumothorax is included the proportion of successfully controlled cases makes more satisfactory reading. By judicious use and discrimination of the various forms of treatment that are available, and above all by elasticity of control, the opportunities for closing cavities in both apices should be increased without necessarily having to wait for a state of affairs in which the disease has arrested itself and surgey has only to deal with mechanical complications.

The emphasis given to partial operations is not intended to overweigh the value of the total operation, and the complications that may occur in apical thoracoplasties are greater than those seen in the more extensive procedures. The case selected is probably less stationary as regards disease, or the dangers of bronchogenic or direct spread of infection to the lower lobe are definitely present. Yet performance of a partial operation is no objection to its being extended to a whole lung collapse at a later date.

Partial or selective collapse has the merit of leaving as much functioning lung tissue as possible intact, and should the misfortune of a further spread into healthy tissue occur at a later date it may be possible to control this new focus by some additional form of partial collapse.

SPONTANEOUS HEALING OF CAVITIES IN PULMONARY TUBERCULOSIS

INFLUENCE OF ALTITUDE

By BERNARD HUDSON,
M.D., M.R.C.P.,
Davos-Platz.

The presence of a cavity in tuberculosis of the lungs is always a potential danger to the patient, and in most cases it is highly desirable, if possible, to effect its closure. If a cavity remains open, the patient, although he may be in good general health, is liable to a number of complications, the principal ones being hæmoptysis, spread of infection in the same or the opposite lung, perforation (generally a fatal event) and, in addition, there is often persistent

PLATE III

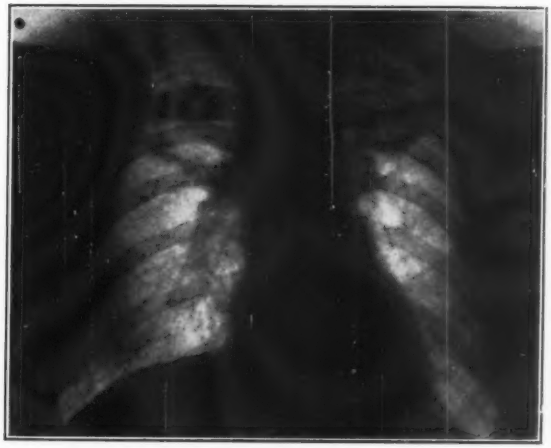

FIG. 1.—CASE 1.

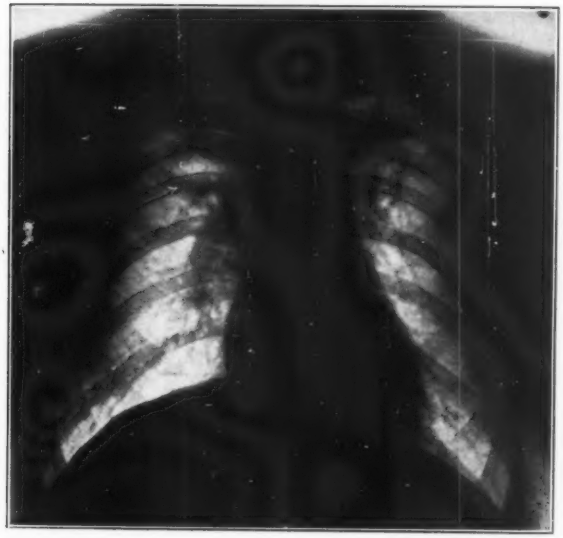

FIG. 2.—CASE 1.

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PLATE IV

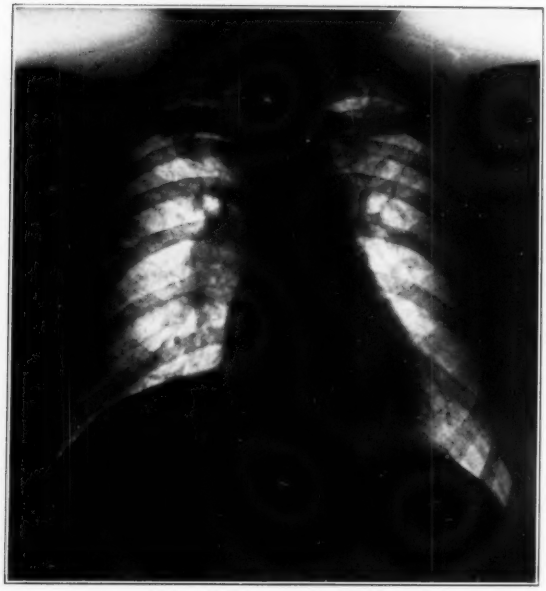

FIG. 3.—CASE 1.

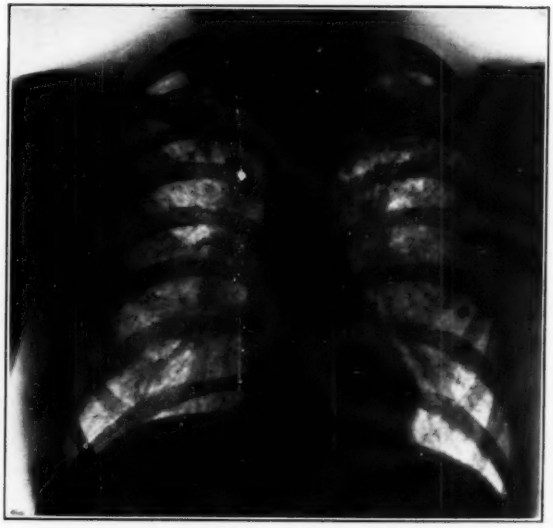

FIG. 1.—CASE 2.

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sputum, usually containing tubercle bacilli, rendering him therefore a source of danger and infection to his fellow-creatures.

There are several ways of effecting the closure of a cavity:

1. The natural method, by rest, climatic treatment, and time.

2. The induction of an artificial pneumothorax, when this is possible, combined with the division of adhesions, when indicated.

3. Phrenicectomy, either alone or in conjunction with artificial pneumothorax.

4. Plombage, either artificial, using wax, or de Winter's operation, where the pectoral muscle itself is employed as the plomb.

5. Finally, there is the operation of thoracoplasty, either complete or partial, according to necessity.

In this short article I should like to point out that the most desirable way of causing the obliteration and healing of a cavity is the natural method.

This natural healing certainly may occur, and is without any doubt, I believe, favoured by residence in the Alpine climate. Usually, if closure is going to take place in this climate, it shows signs of doing so fairly rapidly—as a rule, in from three to six or seven months. If after that time no sign of change, alteration in shape, or diminution of the size of the cavity can be seen, it is very unlikely that it will close by natural means.

It is a well-accepted fact amongst the medical men of experience in Davos that the Alpine climate exerts a great influence, not only as regards the general health and recovery from tuberculosis, but also as regards the alteration, shape, shrinking, and ultimate closure of cavities in certain cases. The reason for this, perhaps, may be found in the character of this climate, and the changes which occur in the human organism at this height (about five to six thousand feet above sea level). Owing to the altitude the air is rarefied, and the barometric pressure lower than at sea level; therefore the partial pressure of oxygen is correspondingly diminished. The physiological effect of this is that breathing becomes deeper, in order that the tissues may receive their proper oxygenation. For the same reason the blood changes its character, the red cells and hæmoglobin both showing an increase. The total amount of the blood is also actually augmented. The air is much drier at this height, and for this reason has a stimulating effect upon the respiratory membranes. There is also a remarkable absence of wind and dust, especially during the winter months, when the snow is on the ground. The air is purer, the light and heat of the sun greater than at lower levels. From the above considerations it is clear that we have in the Alpine climate a valuable therapeutic agent, exerting considerable influence on the metabolism and general health of a patient, and locally on the respiratory mechanism and membranes.

We frequently see at this altitude changes taking place towards healing in a cavity which has shown no signs of so doing at lower altitudes. These changes often commence and manifest themselves with considerable rapidity —*e.g.*, after a few months. I have no hesitation in saying that the Alpine climate has a definite influence on the closure of cavities in tuberculosis of the lungs. This conclusion is based on many years of clinical experience.

In order to understand the possibility of natural closure we may perhaps enumerate the various types of cavities which are met with in pulmonary tuberculosis. In my opinion, the most satisfactory clinical classification of cavities is that one based upon the condition of the wall of the cavity, and its age. This classification is certainly the most useful one from the therapeutic point of view. It is the one put forward by Jaquerod of Leysin.

1. The first-stage cavity is characterised radiographically by a circular outline. However, this outline is soft and not well marked, and the interior of the cavity is not completely clear. There is often in these cases complete absence of expectoration. It is really the stage of precavitation, where the necrotic focus has not yet been entirely destroyed and eliminated.

2. The second-stage cavity is characterised by a more definite circular contour, and the interior is much more clear. There is usually here muco-purulent expectoration. The walls of the cavity, however, are not yet hard, fibrosed, and sclerosed, and are composed of pulmonary tissue infiltrated with fresh tubercles.

3. The third-stage cavities are characterised by a pronounced circular image; they are generally large, and may even occupy a whole lobe. The centre is clear, and there is usually abundant purulent expectoration. In these cases there is generally a fluid level to be seen on radiological examination. The capsule of this type of cavity is composed of a hard fibrous shell, which is non-resistant, thus keeping the cavity open, and isolating it from the neighbouring tissues.

Cavities at the apex of large dimensions, and surrounded by a very little pulmonary tissue, cause, on healing, displacement of the mediastinum and deviation of the trachea. They do not heal so easily as cavities situated in the median region. It is here, in this median region, without doubt, that one finds the most favourable conditions for spontaneous healing. A cavity situated here is less liable to be pulled about by adhesions, and has more pulmonary tissue surrounding it. Cavities which heal spontaneously in a few months nearly always belong to this category. After healing, practically no trace is left, or at most only a few fibrous shadows on the radiograph. Median cavities, situated near the hylus, are much less easily healed. Cavities at the base are in a very disadvantageous situation for healing. They are continually and extensively being disturbed and

PLATE V

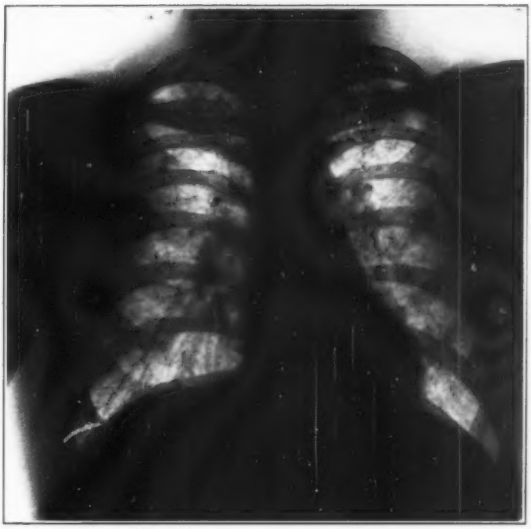

FIG. 2.—CASE 2.

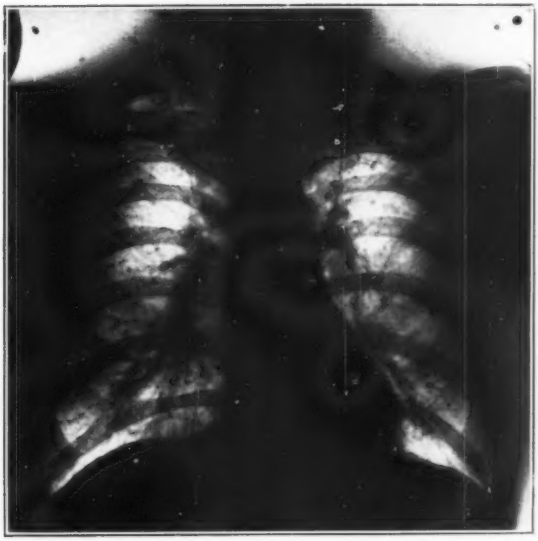

FIG. 3.—CASE 2.

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PLATE VI

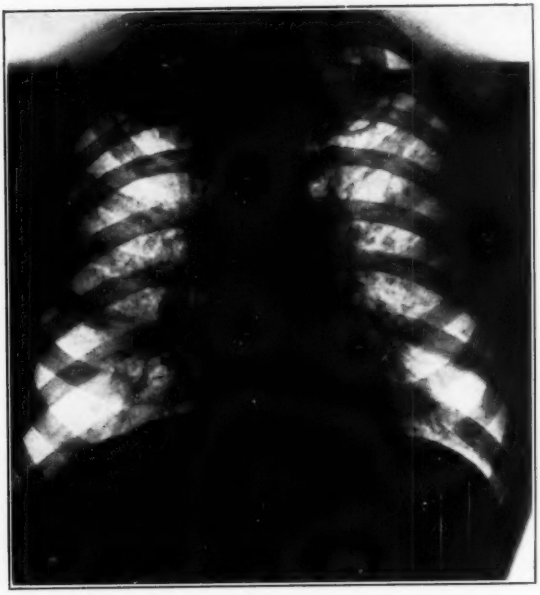

FIG. 1.—CASE 3.

FIG. 2.—CASE 3.

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pulled about by the movements of the diaphragm, a condition very prejudicial to healing.

In addition to the situation of a cavity, its age and the state of its wall have an important bearing on its capacity for spontaneous healing. The most favourable cases are those of recent formation, with soft, lax walls, situated in the median region of the lung, beneath the clavicle, and surrounded by lung tissue, which is abundant and only slightly infiltrated. These are the first-stage cavities mentioned above, and situated favourably. In the second class we must put cavities where the mechanical conditions are less favourable. These are still soft, and are situated at the apex or the hylum, and are surrounded by a considerable amount of infiltration. The third class, the most difficult to heal of all, are also situated unfavourably. In this class we must put those of the third stage, of old standing, and with hard fibrotic walls. Into this class also fall those cavities which, although they may still have soft walls, are situated at the base, especially if they are considerable in size, and where drainage becomes insufficient.

I have chosen three cases to illustrate the above remarks, cases which will be discussed at the end of this article, concerning the natural closure of cavities of the first, second, and third stages. These could be added to by many others.

I have tried to point out that under good conditions of rest, and the ordinary régime treatment, cavities, even quite large ones, with either soft or hard walls may sometimes be cured by natural means without the intervention of any surgical method. I do not mean to say that one must wait indefinitely, hoping that this natural cure will eventually take place. If after a certain time, say three to six months, it is seen that there is no change towards obliteration, it is generally useless to expect a natural cure, and other methods must be thought of.

I have tried to show also that, according to clinical experience, the Alpine climate has a distinctly favourable effect on the healing of these cases. It is the cavities of the first class—that is to say, those of recent formation with soft flaccid walls, especially if localised in the median region of the lung, and surrounded by lung tissue in a fairly healthy condition—which give the best prognosis, and often quickly heal in a natural manner, leaving no trace, or hardly any.

Cavities of the second class, where the walls are more resistant, and especially if localised at the apex or at the hylus, and surrounded by considerable infiltration, have a much less favourable prognosis. Even these sometimes heal without intervention.

Cavities of the third stage, with hard sclerosed walls of old formation, and often with insufficient drainage, are the least favourable of all, and

generally receive most benefit by surgical interference, which subject, however, is outside the scope of this paper. In exceptional cases even these have been known to heal spontaneously.

Case 1.

October 29, 1929.—Radiograph 1 shows cavitation, with infiltration of both upper lobes. Surgical intervention inadvisable.

December 16, 1929.—Radiograph 2 shows the cavities shrinking and healing.

May 15, 1930.—Radiograph 3 shows the cavities healed, and represented by fibrotic scars.

This is a case of first-stage cavities, favourably situated, of recent origin, and soft walls.

Case 2.

June 8, 1925.—Radiograph 1 shows cavitation of both upper lobes, with much infiltration. No surgical intervention was performed.

May 8, 1926.—Radiograph 2 shows the cavities healing, and infiltration drying up.

December 6, 1930.—Three and a half years later. Radiograph 3 shows the cavities and infiltrations represented by dense fibrotic scars.

This is a case of healing of second-stage cavities. The patient has been working, and has had no relapse.

Case 3.

September 17, 1921.—Radiograph 1 shows an apical cavity, old standing, and with much infiltration in both lungs. A third-stage case. No surgical interference was performed.

March 29, 1922.—Radiograph 2 shows the cavities healing, and the infiltration clearing up.

September 17, 1934.—Radiograph 3—*i.e.*, after twelve years—shows perfect healing maintained. The patient is in full work, and has kept well.

I am indebted to Dr. Krause for the radiographs, which are from the collection of the Schweizerhof Sanatorium, Davos. They are merely three examples, chosen out of many similar csase.

PLATE VII

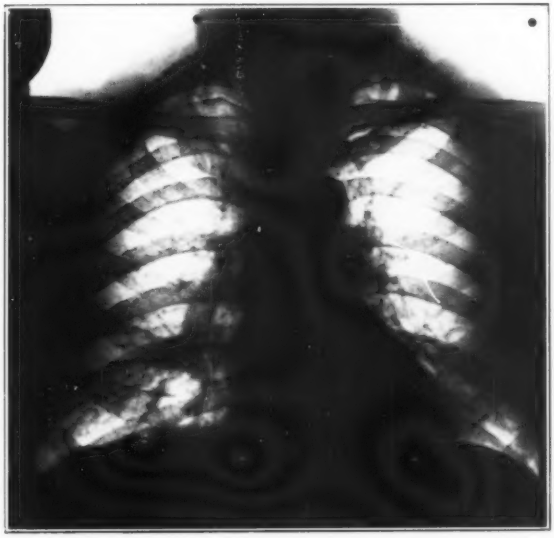

FIG. 3.—CASE 3.

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UNIV. OF MICH.

THE INFLUENCE OF THE ADMINISTRATION OF VITAMIN C ON BLOOD SEDIMENTATION AND SENSITIVITY TO TUBERCULIN

By FRED H. HEISE, GUSTAV J. MARTIN and SPENCER SCHWARTZ,

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Inasmuch as there seems to be a hypovitaminosis C as determined by lessened urinary excretion of vitamin C in patients having active tuberculosis (Heise and Martin[1]), and a hypovitaminosis C in tuberculous guinea-pigs as determined by the ability of the body tissues to take up vitamin C (Yamagami[2]), it was thought desirable to study the possible effects of the administration of large quantities of vitamin C upon some of the diagnostic and prognostic procedures in this disease. The present study relates to the influence of vitamin C upon the blood sedimentation rate and the tuberculin skin test.

Previously Schneider and Widman,[3] using vitamin C therapeutically, produced, though not regularly, a decrease in the globulin content and an increase in the albumin content of the blood, accompanied by a reduction in the sedimentation speed of erythrocytes.

Prausnitz and Schilf,[4] working with tuberculous guinea-pigs on an acute scurvy diet, showed that they reacted to tuberculin to a lesser degree than normals, and that these reactions disappeared more quickly than in tuberculous guinea-pigs subsisting on a normal diet. The febrile reaction after the tuberculin injection was also less marked in the scorbutic animals. Bieling[5] found that this decreased sensitivity to tuberculin was not, however, indicative of a generalised non-susceptibility to tuberculin, as the animals with scurvy died in greater numbers than did the normal controls when this substance was injected subcutaneously in large amounts. Observations with antigenic principles other than tuberculin have shown this same decreased sensitivity in scorbutic animals. Bieling[6] and Arkwright[7] found that markedly scorbutic guinea-pigs gave smaller skin reaction to diphtheria toxin than did normal pigs. Chapman and Morrell[8] noted a lessened sensitivity to neoarsphenamine skin tests in scorbutic guinea-pigs and Simon[9] a lessened poison ivy sensitivity in hypovitaminosis C. Recently[9] Greene *et al.*[10] reported rather inconsistent findings. They state: "The partial

lack of the vitamin in the diet appeared to result in a weaker reaction to tuberculin in animals infected by feeding sputum or in those subcutaneously inoculated with R_1 or with 0·012 mg. of H_{37}, but not in the other groups. These latter were the groups inoculated subcutaneously with 0·1 mg. of strain H_{37} and those fed the same organism."

TABLE I.

EFFECT OF VITAMIN C THERAPY ON SEDIMENTATION RATES.

Subnormal Vitamin C Excretion before Injection.

Case No.	*Previous Daily Excretion of Vitamin C.*	*Amount Vitamin C Injected.*	*Period over which Injection Made.*	*Sedimentation Rate Before.*	*Sedimentation Rate After.*	*Change.*
1	8·5 mg.	400 mg.	2 days	20 mm.	14 mm.	−6
2	8·4 ,,	800 ,,	4 ,,	22·5 ,,	10 ,,	−12·5
3	6·5 ,,	800 ,,	2 ,,	18 ,,	26 ,,	8
4	3·8 ,,	900 ,,	3 ,,	20 ,,	13 ,,	−7
5	12·5 ,,	300 ,,	1 ,,	3 ,,	2·5 ,,	−0·5
6	8·9 ,,	800 ,,	4 ,,	21 ,,	8 ,,	−13
7	9·1 ,,	200 ,,	1 ,,	15 ,,	11 ,,	−4
8	6·15 ,,	200 ,,	1 ,,	20 ,,	13 ,,	−7
9	9·15 ,,	200 ,,	1 ,,	16 ,,	19 ,,	3
10	9·1 ,,	200 ,,	1 ,,	19 ,,	14 ,,	−7
11	13·3 ,,	300 ,,	3 ,,	21 ,,	14 ,,	−7
12	11·6 ,,	800 ,,	4 ,,	24 ,,	21 ,,	−3
13	9·8 ,,	300 ,,	3 ,,	3 ,,	4 ,,	1
14	12·5 ,,	400 ,,	2 ,,	3·5 ,,	2 ,,	−1·5
15	9·3 ,,	200 ,,	1 ,,	14·5 ,,	21 ,,	6·5
16	3·4 ,,	1,000 ,,	5 ,,	25 ,,	24 ,,	−1
17	5·2 ,,	1,000 ,,	5 ,,	17 ,,	16 ,,	1
18	5·2 ,,	1,000 ,,	5 ,,	4 ,,	3 ,,	−1
19	8·4 ,,	1,000 ,,	5 ,,	21 ,,	16 ,,	−5
						Average: −2·8
			Normal Vitamin C Excretion before Injection.			
20	42·8 mg.	1,000 mg.	5 days	5 mm.	5·5 mm.	−0·5
21	14·58 ,,	1,000 ,,	5 ,,	29 ,,	27 ,,	−2
22	15·5 ,,	400 ,,	2 ,,	12 ,,	13 ,,	1
23	17·8 ,,	200 ,,	1 ,,	15 ,,	14 ,,	−1
24	14·1 ,,	800 ,,	4 ,,	21 ,,	20 ,,	−1
						Average: −1·6
			Controls.			
1	5·5 mg.	—	5 days	11 mm.	12 mm.	1
2	8·25 ,,	—	5 ,,	29 ,,	28 ,,	−1
3	7·45 ,,	—	5 ,,	27 ,,	25 ,,	−2
4	11·8 ,,	—	5 ,,	10 ,,	6 ,,	−4
5	6·25 ,,	—	5 ,,	28 ,,	26 ,,	−2
6	13·4 ,,	—	5 ,,	21 ,,	20 ,,	−1
						Average: −1·5

TABLE II.

THE EFFECT OF THE INTRAVENOUS ADMINISTRATION OF CEVITAMIC ACID ON TUBERCULIN SENSITIVITY USING SAME TUBERCULIN (O.T.) BEFORE AND AFTER.

Case No.	Date.	Daily Excretion of Ascorbic Acid in Mg. (200 Mg. Ascorbic Acid injected Daily).	Tuberculin Testing.							
			Strength of Dilution Used.	Erythema (Sq. Mm.).		Induration (Sq. Mm.).		Decrease in Erythema.		Decrease in Induration.	
				24 Hrs.	48 Hrs.	24 Hrs.	48 Hrs.	24 Hrs.	48 Hrs.	24 Hrs.	48 Hrs.
1	2/19	6·03	0·00001	100	100	25	64				
	2/20	76·3									
	2/21	113·0									
	2/22	—		36	25	0	0	64	75	25	64
2	2/19	11·6	0·00001	64	144	25	100				
	2/20	107·0									
	2/21	112·0									
	2/22	78·0									
	2/23	101·1		49	64	25	48	15	80	0	52
3	2/19	8·9	0·00001	64	144	25	100				
	2/20	23·6									
	2/21	15·5									
	2/22	12·6									
	2/23	11·4		0	4	0	0	64	140	25	100
4	2/19	8·4	0·0001	165		100					
	2/20	72·0									
	2/21	118·0									
	2/22	109·2						65			
	2/23	94·5		100		64				36	

TABLE III.

EFFECT OF INTRAVENOUS ADMINISTRATION OF CEVITAMIC ACID ON TUBERCULIN SENSITIVITY.

Final Tuberculin Test made with Stronger Tuberculin Solution.

Case No.	*Date.*	*Ascorbic Acid Excretion in Mg. in 24 Hours (200 Mg. Ascorbic Acid injected Daily).*	*Tuberculin Test.*								
			Strength of Reacting Dose.	*Erythema (Sq. Mm.).*		*Induration (Sq. Mm.).*		*Alteration in Erythema in Sq. Mm.*		*Alteration in Induration in Sq. Mm.*	
				24 Hrs.	*48 Hrs.*	*24 Hrs.*	*48 Hrs.*	*24 Hrs.*	*48 Hrs.*	*24 Hrs.*	*48 Hrs.*
1	4/15	3·4	0·0001	121	169	100	100				
	4/16	22·0									
	4/17	69·5									
	4/18	94·3									
	4/19	92·0		225	400	100	225	104	231	0	125
2	4/15	5·2	0·000001	400	300	324	225				
	4/16	21·2									
	4/17	41·0									
	4/18	68·5									
	4/19	77·0		255	875	100	150	−145	575	−224	−75
3	4/15	6·2	0·0001	100	100	64	64				
	4/16	8·0									
	4/17	27·4									
	4/18	17·3									
	4/19	16·4		255	210	100	110	155	110	36	46

4	4/15	8·2	0·000001	70	48	9	25				
	4/16	8·3									
	4/17	22·7									
	4/18	13·2									
	4/19	33·7		195	255	100	100	125	207	91	75
5	4/15	42·8	0·000001	64	150	25	100				
	4/16	119·9									
	4/17	180·0									
	4/18	174·7									
	4/19	161·1		204	480	100	100	140	330	75	0
6	4/15	4·95	0·00001	4	80	4	25				
	4/16	7·2									
	4/17	12·7									
	4/18	—									
	4/19	12·5		64	400	25	64	60	320	21	39
				Controls.							
7	4/15	5·5	0·0001	240	225	100	100				
	4/19	8·7		500	625	225	225	260	400	125	125
8	4/15	8·25	0·0001	180	400	100	225				
	4/19	11·7		600	750	375	400	420	350	275	175
9	4/15	7·45	0·00001	36	120	0	25				
	4/19	8·9		100	500	25	100	64	380	25	75
10	4/15	11·8	0·0001	300	225	225	144				
	4/19	9·4		1,125	300	400	225	825	75	175	81
11	4/15	6·25	0·000001	180	225	100	100				
	4/19	9·25		500	1,250	144	144	320	1,025	44	44
12	4/15	13·4	0·00001	80	180	81	49				
	4/19	11·1		300	576	225	225	220	396	144	176

In our study of the effect of vitamin C upon the sedimentation rate (Cutler method[11]), observations were made upon thirty tuberculous patients. The urinary excretion of vitamin C was previously determined in each from a twenty-four-hour specimen of urine, titrated with dichlorphenol-indophenol according to the method of Tillmans,[12] and Harris and Ray.[13] Of these thirty, six were used as controls and received no added vitamin C; twenty-four received varying quantities from 200 to 1,000 mg. intravenously over a period of from one to five days. The sedimentation rates were determined immediately before the use of vitamin C and again after the final injection. Preliminary subnormal urinary excretion of vitamin C was demonstrated in nineteen of those receiving added vitamin C and in all of the controls. Five patients had preliminary normal urinary excretion of vitamin C. Of the nineteen with preliminary subnormal urinary excretion of vitamin C, 47 per cent. showed a significant decrease and 10 per cent. an increase in sedimentation rate following vitamin C injection; 43 per cent. showed no change. Of the five with previously normal vitamin C urinary excretion, none showed significant changes in sedimentation rate after injection of vitamin C. No alteration in the sedimentation rate was observed in the six controls after a period of five days. Numerous other observations of the sedimentation rate in the tuberculous at Trudeau revealed no decrease of more than 3 mm. in the course of a week. It would seem from these observations that a condition of hypovitaminosis C may, in a large number of patients, influence the sedimentation rate. Table I. gives the details of observation in each of the thirty patients.

In the study of the effect of vitamin C upon tuberculin skin sensitivity sixteen patients were given a test with sufficient tuberculin to cause only a mild intradermic reaction (about 10×10 mm. erythema). Readings were made at twenty-four and forty-eight hours of the extent of the erythema and of the induration. Six of these patients were used as controls and received no cevitamic acid. Ten were given 200 mg. cevitamic acid intravenously daily, beginning after the forty-eight-hour reading of the tuberculin test. Urinary excretion of vitamin C (twenty-four hour) was determined each day for each patient receiving cevitamic acid, and at the beginning and end of the experiment in those used as controls.

Skin test readings were made at the end of twenty-four hours, when the maximum effect of the cevitamic acid should manifest itself, and at forty-eight hours, at which time the urinary excretion should have returned nearly to normal value.

It was intended to use the same tuberculin dilutions for tests and retests. However, the dilutions were unavoidably disposed of before all retests were made. Four patients, however, received retest doses from the same prepara-

tion of the tuberculin used in the original test. Twelve were retested with freshly prepared solutions of evidently greater potency, though of the same volumetric dilution. Six of these were given cevitamic acid and six were used as controls. Table II. gives the details of reactions in the four patients receiving the same tuberculin and Table III. in the twelve receiving two different potency dilutions as described above.

A distinct decrease in sensitivity to the same dose of tuberculin was found after the patient received cevitamic acid, and those receiving cevitamic acid responded less acutely to a retest with stronger tuberculin than did the controls. In many years of intracutaneous tuberculin testing at Trudeau Sanatorium no marked changes in sensitivity had been noted even over a period of months. In Table II. patient No. 3, who showed the most marked hypovitaminosis after intravenous injection of cevitamic acid, also showed the greatest change in tuberculin sensitivity. Tuberculin previously causing a skin reaction failed to do so in the same dose after cevitamic acid was given.

TABLE IV.

ALTERATIONS IN TUBERCULIN SENSITIVITY FOLLOWING INTRAVENOUS ADMINISTRATION OF VITAMIN C.

	Change in Erythema (Sq. Mm.).		*Change in Induration (Sq. Mm.).*	
	24 Hrs.	*48 Hrs.*	*24 Hrs.*	*48 Hrs.*
Experimentals	104	231	0	125
	−145	575	−224	−75
	155	110	36	46
	125	207	91	75
	140	330	75	0
	60	320	21	39
Average for experimentals	76	296	−3	35
Controls	260	400	125	125
	420	350	275	175
	64	380	25	75
	825	75	175	81
	320	1,025	44	44
	220	396	144	176
Average for controls	351	437	123	113

The average increase in the twenty-four-hour erythema readings in the controls in Table III. was 351 sq. mm., as contrasted with 76 sq. mm. increase in those receiving cevitamic acid. The induration of the controls averaged

123 sq. mm. and in the cevitamic acid group – 3. At forty-eight hours the differences were not so marked. Table IV. shows this more plainly.

While the number of observations made do not permit definite conclusions, it would seem that in the presence of saturation with cevitamic acid tuberculin sensitivity becomes less. This is more noticeable at the twenty-four-hour test reading when the full effect of the cevitamic acid has been got, and less noticeable at forty-eight hours when the cevitamic acid excreted in the urine returns toward the normal in quantity.

Discussion.

Cevitamic acid when administered intravenously often reduces the sedimentation rate if abnormally high and seems to lessen tuberculin sensitivity.

Both of these alterations may be explained in part at least upon the assumption of an existing mild hypovitaminosis C. During this state the blood capillaries apparently lose their resistance and may be more porous to substances elaborated at the site of disease, causing the increased sedimentation rate and skin sensitivity to tuberculin. Correcting this state by saturating the blood with vitamin C, less absorption takes place into the blood stream, with subsequent alterations in the sedimentation rate and skin sensitivity.

Another possible explanation may be that adrenalin action is increased by the cevitamic acid as found by Kreitmar,[14] thereby lessening hypersensitivity in general. Therapeutically adrenalin has been in general use for this purpose.

As far as skin sensitivity is concerned, our results differ considerably from those of other observers, who found lessened reaction during scurvy and lowered vitamin C states. They would, however, in part agree with the findings of Jungeblut and Zwemer,[15] who detected a lessened reaction to diphtheria toxin locally after giving cevitamic acid.

Conclusions.

Approximately 50 per cent. of cases of pulmonary tuberculosis show significant lowering of sedimentation rates after the intravenous administration of cevitamic acid. Tuberculin sensitivity is altered in a similar manner. The question is raised as to the significance of these prognostic criteria in the absence of knowledge concerning the state of vitamin C saturation of the body, as alterations in both tests occur in hypovitaminosis C.

These observations suggest that the prognostic significance of both the

tuberculin reaction and the blood sedimentation rate may have to be revaluated and interpreted in the light of co-existent vitamin C saturation.

Acknowledgment is made to Merck and Co., Rahway, N.J., for cebione, the cevitamic acid used in the experiment.

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A STUDY OF CERTAIN FACTORS AFFECTING THE SEDIMENTATION TEST

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The Westegren method of determining the sedimentation rate was used. The blood was taken from a vein at the elbow, diluted with one part of 3·8 per cent. sodium citrate solution to four parts of blood, mixed by drawing the blood up and down the pipette, and then immediately set up. Earlier readings had to be discarded because the tubes had not been strictly vertical.

A series of estimations of sedimentation was made drawing the blood up to the 200 mm., 150 mm., 100 mm., and 50 mm. marks respectively in four tubes. The shapes of the curves obtained did not differ, but the maximum fall was more quickly reached in the shorter tubes.

(1) Sedimentation rates were taken on normal medical students before and after exercise. The rate was found to be increased by exercise. The increase was apparent in the first and second hours, as well as later. In a few cases the sedimentation rate was doubled in the first hour. Only forms of exercise to which students were accustomed were used in these tests. The results for the individual students varied greatly. The increased rate of fall was greater in the first than in the second hour.

(2) Sedimentation rates were taken before and after meals. There was found to be a decreased sedimentation rate during digestion, the maximum

being reached one to one and a half hours after food. The alterations in the rates were great, and when a daily or alternate day record was kept of the sedimentation rate in a single subject, very great variations were

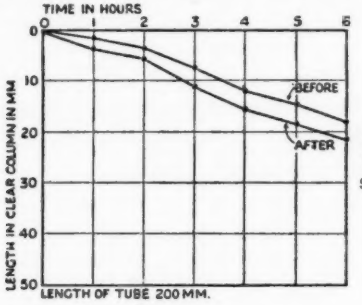
TIME IN HOURS
0 1 2 3 4 5 6
0 10 20 30 40 50
LENGTH IN CLEAR COLUMN IN MM.
BEFORE
AFTER
HALF HOUR GAME OF SQUASH
LENGTH OF TUBE 200 MM.

CHART 1.

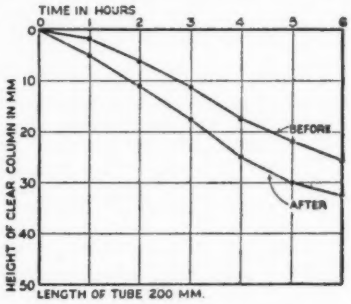

CHART 2.

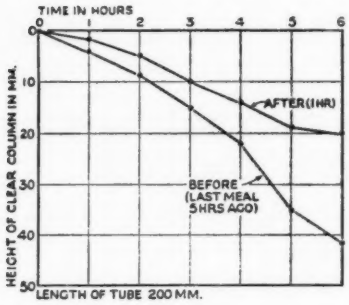

CHART 3.

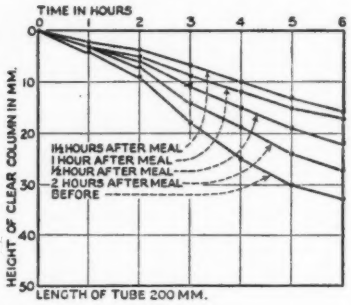
TIME IN HOURS
0 1 2 3 4 5 6
0 10 20 30 40 50
HEIGHT OF CLEAR COLUMN IN MM.
1½ HOURS AFTER MEAL
1 HOUR AFTER MEAL
½ HOUR AFTER MEAL
2 HOURS AFTER MEAL
BEFORE
LENGTH OF TUBE 200 MM.

CHART 4.

THE EFFECT OF FOOD ON SEDIMENTATION RATE.

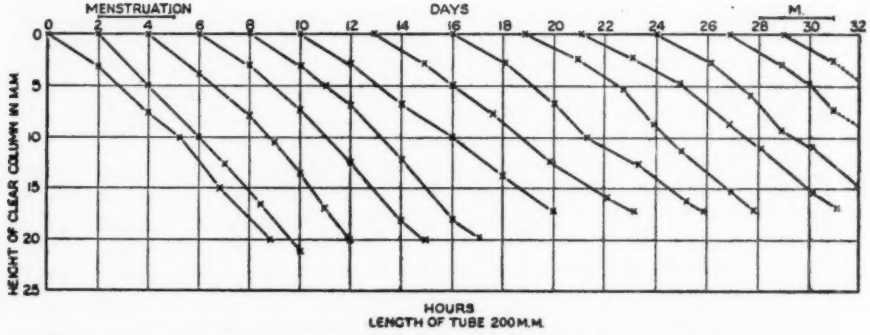
MENSTRUATION
DAYS
M.
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32
0 5 10 15 20 25
HEIGHT OF CLEAR COLUMN IN M.M.
HOURS
LENGTH OF TUBE 200 M.M.

CHART 5.—RECORD OF SEDIMENTATION RATE IN A NORMAL STUDENT AGED TWENTY-TWO YEARS THROUGHOUT THE MENSTRUAL PERIOD.

found unless the blood was taken each day at the same time and the time of the preceding meal was fixed.

(3) Sedimentation rates were estimated on a number of normal students

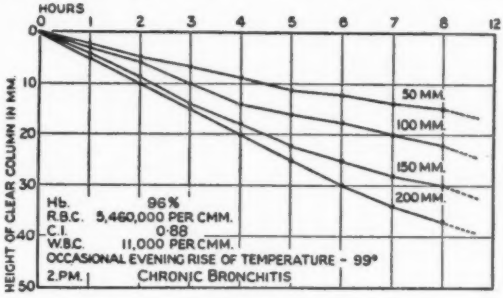

CHART 6.

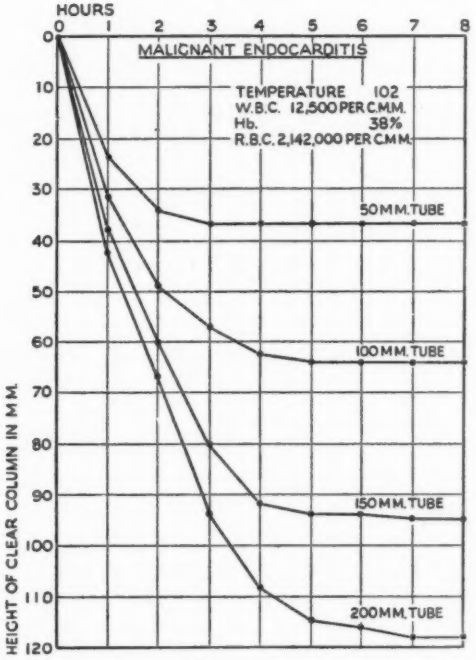
HOURS
0 1 2 3 4 5 6 7 8
MALIGNANT ENDOCARDITIS
TEMPERATURE 102
W.B.C. 12,500 PER C.MM.
Hb. 38%
R.B.C. 2,142,000 PER C.MM.
50 M.M. TUBE
100 M.M. TUBE
150 M.M. TUBE
200 M.M. TUBE
HEIGHT OF CLEAR COLUMN IN M.M.
0 10 20 30 40 50 60 70 80 90 100 110 120

CHART 7.

throughout the menstrual cycle. There was an increased rate in relation to menstruation, reaching a maximum rapidly a day or two days before the beginning of menstruation. The increase was less marked in patients who already had a high rate.

CLINICAL CASES

ARTIFICIAL PNEUMOTHORAX COMPLICATED BY ACUTE LOBAR ATELECTASIS

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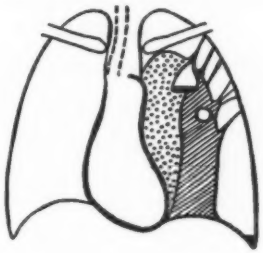
The patient, a married woman aged thirty-eight, was admitted to Montana Hall on April 21, 1936. There was infiltration in the upper and middle zones of the left lung, with cavity formation. There were 80 to 100 c.c. of sputum daily; it was positive for tubercle bacilli. Temperature was slightly raised. The blood sedimentation rate was 55 in the first hour (Westergren method).

A left artificial pneumothorax was induced on May 27. By the middle of July there was a definite improvement in the general condition. Temperature settled to normal limits and the blood sedimentation rate fell to 13. There was also a marked diminution in the amount of sputum, which now averaged 15 to 20 c.c. daily. It remained positive. Owing to the presence of adhesions preventing collapse of the cavities, thoracoscopy was decided on, but had for personal reasons to be postponed. Small refills were being given every four to five days, on account of the mediastinum being somewhat mobile.

A refill was given on August 3. Temperature was 99° that night, 99·2° on August 4, and 100·4° on August 5. The usual pulse-rate of 82 to 90 increased slightly. There was no abnormality to report on physical examination, except some dullness on percussion on the left side posteriorly, towards the spinal column. On August 6 the patient awakened with a temperature of 103·6°. There was some malaise, and she complained of a "dull dragging" pain on the left side of the chest. The temperature dropped that night to 102°, and the pulse was 116. During the whole of this day there was no sputum. There was a little sputum on

the 7th, and the temperature dropped to 101° that morning and to 99·2° that evening. The patient still complained of the pain on the left side of the thorax, mostly in the back. Screening showed that there was an area of atelectasis on the left side, involving apparently the whole of the lower lobe. Temperature dropped to 99° on the morning of the 8th, and afterwards to normal. The sedimentation rate went up to 25, and subsequently dropped to 13 a week later. The amount of sputum soon returned to its previous daily average.

A radiograph was taken on the 10th (see sketch). Screening on the 17th showed that the signs of atelectasis had almost cleared up.



The adhesions were subsequently divided in three stages by Dr. F. G. Chandler.

I am indebted to Dr. J. W. Craig for his observations during my absence, when the patient developed the atelectasis.

The Librarian of the B.M.A. has kindly sent me the following references in the literature to this condition, the occurrence of which has been rarely described during artificial pneumothorax treatment:

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A CASE OF CARCINOMATOSIS OF THE LUNGS

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AND
F. P. LEE LANDER,
M.D., M.R.C.P.,
Medical Registrar, the Brompton Hospital.

R. C., aged forty-three, married woman, a fur worker for nineteen years, was referred to the hospital in September, 1936, by Dr. M. D. Ripka, of 78, George Street, Euston, with a history of cough and expectoration, febrile temperature, night sweats and loss of weight. She was first seen by Dr. Clifford Hoyle in the Out-patient Department, who found, on physical examination, a few scattered râles, but beyond this there was nothing noteworthy. A few days later she was admitted to the wards under the care of one of us.

The family history was negative as regards chest disease, and her past history contained no special feature. Further history of the present illness, obtained here, was to the effect that the patient had noticed sweating and loss of weight since February, 1936, and that in June of the same year she had developed a cough and an evening temperature in the neighbourhood of 100° F.

On admission to the wards there were no additional symptoms, and no hæmaturia or frequency; her temperature range varied between 98° and 101°, her pulse from 90 to 110, and her respirations were about 25. On physical examination the note at the right base was impaired and a few scattered râles were present in this situation. Both kidneys were palpable, the right somewhat enlarged and mobile. Blood pressure was 160/90.

Various special investigations were made, of which the following were the most important:

Urine, catheter specimen: Many pus and red blood cells, with contaminating organisms and a trace of albumen.

Blood urea: 37 mgm. per 100 c.c.

Sputum: Amount varied between 2 and 6 ozs. daily. Repeated examinations showed no tubercle bacilli and no unusual organisms.

Blood Wassermann reaction: Negative.

Sedimentation rate: 5·2 cm. in the hour (Brompton Hospital method, and corresponding to a drop of a little over 50 per cent. Westergren method).

X-ray examinations:

September 15, 1936.—Right lung: Partial consolidation in the middle and lower zones, the nature of which was not evident at that time.

Left lung: Congestive in appearance.

October 9, 1936.—Both kidneys appeared to be enlarged.

Right kidney: There were some opacities which moved with the kidney shadow, suggesting calcareous deposits.

Left kidney: Renal calculi.

Bladder and lower ureters negative.

October 15, 1936.—Compared with the previous examination on September 15, 1936, there was then definite mottling in the left upper and middle zones, finely granular in character, and the right middle and lower zones were slightly more opaque.

The case is peculiar in that the history strongly suggested a diagnosis of pulmonary tuberculosis, which the sputum did not of necessity negative.

On the other hand, the X-ray picture exhibited no characteristic features supporting such a diagnosis, but did not very clearly suggest another. The presence of a toxæmia, coupled with her work as a furrier along with the X-ray picture, indicated the alternative possibility of an infection with a rare organism or of inhaled particles of fur, but repeated examinations of the sputum failed to support this. Both kidneys were enlarged, and the possibility of new growth in this situation was not lost sight of; but the X-ray picture of the renal regions showed the presence of calcareous deposits and calculi which might have been responsible for the abdominal finding, whilst the anomalous lung appearances lent no support to the idea of secondary deposits here.

A further X-ray picture, about a month after the first, again failed to throw any very convincing light on the nature of the illness. Meanwhile the general condition of the patient had seriously deteriorated and it had become obvious that a fatal termination would not be long delayed. She died on November 2, 1936.

Post-mortem examination revealed a squamous-celled carcinoma of the right kidney and miliary carcinomatous deposits in both lungs.

In the light of the post-mortem findings the nature and progress of the illness is, of course, explained, but it is remarkable that at no time did the X-ray picture of the chest possess features clearly indicative of local massive or diffuse miliary deposits. New growth of the kidney had been thought of, but this clinical diagnosis, in view of the anomalous results of physical and special examinations, seemed to require the co-existence of two diseases and thus a double diagnosis, which, in the absence of convincing evidence, is rarely satisfactory.

A CASE OF CHYLOUS EFFUSION DUE TO LEIOMYOSARCOMA

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M.D., F.R.C.P.,

Physician to the Royal Free Hospital and to the Brompton Hospital for Consumption and Diseases of the Chest.

AND

JOAN M. ROSS,

M.D., M.R.C.S., L.R.C.P.,

Reader in Pathology, University of London, Unit of Pathology, Royal Free Hospital.

The patient, a woman of thirty-six, was admitted to hospital on June 3, 1936, with extreme cyanosis and orthopnœa. She began to have attacks of shortness of breath two years previously and they had become gradually worse.

On examination the heart was slightly displaced to the right, the sounds were weak, but no murmurs were heard. There were signs of a small effusion in the left pleural cavity. The liver was tender and enlarged to the level of the umbilicus.

On June 9 she suddenly developed severe dyspnœa and signs of great increase in the left pleural effusion were found. Two pints of fluid of true chylous character were aspirated and this gave temporary relief, but the liquid rapidly reaccumulated and a further 30 ozs. was aspirated on June 11. The patient died the next day.

At the post-mortem about 4 pints of chylous fluid was present in the left pleural cavity. The right lung was bulky and semi-transparent. On section it had a honeycomb appearance. The left lung, although collapsed, showed a similar structure. The branches of the pulmonary artery in both lungs showed patches of atheroma. The right and left pulmonary vessels also showed patches of atheroma, and the wall of the main pulmonary artery was hypertrophied. The right side of the heart was greatly dilated and the wall hypertrophied. The left side of the heart and the valves were normal.

The liver and spleen showed congestion. All the lymph glands in the abdomen were enlarged, white and soft. The normal glands were completely

replaced by a spongy tissue which frayed on section. A mass of similar texture was found on the left side extending from the renal vessels to the brim of the pelvis. The thoracic duct was traced into an elongated soft cystic swelling just above the diaphragm. On incision chyle escaped and the swelling collapsed, leaving tissue resembling that found in the abdominal glands.

Several small fibromyomata were present in the wall of the uterus, otherwise the organs appeared normal. The mass from the left side of the abdomen and specimens of the glands and of the swelling involving the thoracic duct were examined microscopically. All showed a similar structure. Interlacing bundles of elongated cells had replaced the tissue of the lymph glands. Special stain proved these cells to be plain muscle fibres. A diagnosis of *leiomyosarcoma* was made. The tumour was permeating the lymphatic vessels throughout the upper part of the abdomen.

Sections of the lungs showed diffuse dilatation of all the bronchioles, and of the alveolar ducts; in addition, there was a widespread permeation of the intrapulmonary lymphatics by the tumour tissue.

The tumour found at the post-mortem was probably metastatic growth from one of the uterine tumours which had undergone malignant change. It was unfortunate that the uterine tumours were not examined microscopically, but on naked-eye examination they appeared quite innocent. The dilatation of the bronchioles in the lungs was undoubtedly long-standing, possibly congenital, and would account for the hypertrophy of the right side of the heart and the changes in the pulmonary artery and its branches.

This form of new growth is extremely rare and it is a remarkable coincidence that it should have occurred in a case of congenital bronchiectasis, which itself is a rare condition.

CONSULTATION

CASE

By CLIFFORD HOYLE,
M.D., M.R.C.P.

This is the case of a girl, aged nineteen, whom I saw in consultation in May of this year. For about three months she had been unaccountably tired at her work in a bank, and for the last month had complained of a cough which had quickly become productive to the extent of a few drachms of sputum daily. On one occasion a pleuritic pain in the upper part of the right side of the chest had been present for two days. Previously her health had always been good; there had been the usual childish ailments, including measles and whooping-cough, but these had not been of any severity and the chest had never at any time come under suspicion until now.

Her general condition was reasonably satisfactory; there was some pallor and anxiety, but her weight was within a few pounds of normal and her pulse-rate not above ninety per minute. Physical examination of the lungs revealed defective movement and dullness down to the fourth rib in front and to the fifth dorsal spine behind on the right side; bronchial breathing and fine râles extended from the first to the third rib in front, and granular breath sounds and fine râles to the second dorsal spine behind. The larynx was normal. Radiographs showed a rather extensive soft infiltrative mottling in the upper and middle zones of the right lung, with areas of fusion and a round, moderately thick-walled cavity 1½ inches in diameter lying near the periphery of the upper lobe just below the clavicle. The left lung appeared normal radiologically. Numerous tubercle bacilli were found at the first examination of the sputum.

The interest of this case rests upon the fact that it is typical of a common form in which pulmonary tuberculosis first becomes recognised, and in the therapeutic problem that it offers. This type of the disease, "the right upper lobe type," is seen most often in young adult females, often reaches an extensive degree before it is discovered, though remaining unilateral, progresses quickly to excavation in the peripheral part of the lung, and produces an almost uniform radiological appearance. This is characterised by soft and

rather coarse infiltration fusing to form a consolidated area lying chiefly in the outer part of the upper lobe between the first and fourth ribs. Above the diseased area fades gradually into normal lung towards the apex, which is usually free, while below there is sharp demarcation by a thickening interlobar septum.

The immediate problem in this group of patients is whether to advise an early artificial pneumothorax as a supplement to resting treatment. In this particular patient it seemed advisable from the evidence available when she was first seen—the qualified prognosis at her age, the existing extent of unilateral disease, and the presence of a necrotic cavity of moderate size already formed near to the pleura. The positive sputum emphasised the risks of further spread of the disease, particularly if the cavity did not close effectively. The history of pleuritic pain warned of the troublesome adhesions that might be found later should pneumothorax be postponed and then be needed after all. Additional to these reasons was the presence of toxæmia uncontrolled by rest; she remained febrile for two weeks, though at strict rest in bed in hospital. As always the personal factors weighed greatly in deciding, and in this patient favourably, for she was a sensible and co-operative subject. Moreover, she was economically dependent upon herself to a large degree.

The position was therefore that if relaxation therapy was to be allowed the best chances of success, then it should be used at once. She was advised to this effect, and the immediate result was completely satisfactory. The collapse obtained was largely selective of the diseased upper lobe, and quickly reduced the size of the cavity; no important adhesions were found to interfere and no further spread of the disease occurred. Within ten days of commencing the pneumothorax the pyrexia and tachycardia subsided and sputum was reduced to a trace daily.

This successful progress continued for eight weeks, by which time the cavity appeared to be closed. Her general condition improved considerably, with a gain of five pounds in weight; her sedimentation rate returned to normal, and sputum disappeared. She then had a smart febrile attack with a temperature rising to 102° on one occasion. Clinically and radiologically a small effusion was recognised at the right base three days after the onset of fever, and a sample taken showed it to be straw-coloured, sterile, and containing an excess of lymphocytes. A mobile mediastinum became displaced slightly to the left, leaving the degree of collapse and the intrapleural pressures unaffected at first.

This was clearly an inflammatory effusion from a recrudescence of the disease, and beyond a return to rest in bed it called for no immediate measures. During the next two weeks, however, a smouldering pyrexia was accompanied

by a moderate increase in the amount of fluid, which rose to the level of the sixth rib, with further displacement of the mediastinum and the appearance of a small mediastinal hernia. On this account a small air replacement of the fluid was done. Two weeks later the fluid had again accumulated to its former level, the temperature was still unstable, and her weight had fallen slightly. A further air replacement was done, leaving the mediastinum little if at all displaced and the intrapleural pressure at a negative value.

From this time she made steady progress. The temperature became stable in the succeeding week, she began to gain weight, and the remaining traces of fluid quickly absorbed. The degree of collapse was still enough to keep the original cavity closed, and sputum tests now failed to reveal tubercle bacilli. A month later she was allowed to get up, and shortly afterwards went to a sanatorium, where she has continued to make steady progress.

MEETINGS OF SOCIETIES

JOINT TUBERCULOSIS COUNCIL

MEMORANDUM ON TUBERCULOUS INFECTION IN NURSES

At a meeting of the Joint Tuberculosis Council held on Saturday, November 21, 1936, a report of a sub-committee on Tuberculosis Infection among Nurses was considered. Before submitting their report, the Committee had communicated with a large number of hospitals and sanatoria, and replies had been received from thirty-eight of these. It was perhaps unfortunate that most of the replies had come from special institutions for tuberculous patients, for in these special precautions are usually taken to which less attention would possibly be given in general hospitals. Whether this is so or not, the replies did not modify the impression previously formed by the Committee that the risk of infection is likely to be higher in general hospitals which occasionally receive tuberculosis cases than in the special institutions. Particular consideration was given to the age at which probationers are employed. The age at entry is usually eighteen years, but a shortage of candidates has reduced this age to seventeen in some areas. In view of the special susceptibility of adolescent females to develop pulmonary tuberculosis it was then considered undesirable that young girls should be employed, and the recommendation was made that no probationer under the age of eighteen years should be accepted for work in wards occupied by phthisical patients. It was, however, pointed out that the actual age limit was probably of much less importance than the degree of care given to the conditions under which young nurses work.

The hours of work at the institutions replying to the questionnaire varied from forty-eight to seventy-seven per week, the average for probationers being about sixty hours. This is somewhat longer than the period recommended by the College of Nursing.

The importance of medical examination of nurses who are exposed to the risks of infection, both at the time of commencing work, and subsequently, is obvious, but it is noteworthy that only about half of the institutions replying to the questionnaire include an X-ray examination, though clinical examination is almost universal. As radiography is the most important method of detecting incipient tuberculosis at a stage when physical signs are negative, and even symptoms may be absent, a skiagram at the time of a nurse's entry

is insufficient. The Council recommend that X-ray examination should be repeated at least annually where nurses are serving tuberculous patients with open pulmonary lesions. In some sanatoria X-ray examination of the chest is a routine whenever malaise, lassitude, or cough indicates the possibility of early disease. Monthly weighing of nurses is also recommended.

POST-GRADUATE COURSES

THE following Post-Graduate Course on Diseases of the Chest with Special Reference to Chronic Pulmonary Suppuration will be given by the Medical and Surgical Staff of the City of London Hospital for Diseases of the Heart and Lungs, Victoria Park, E. 2.

Monday, February 1:

11 a.m. Dr. Franklin Wood: Radiology of the Heart.

2 p.m. Dr. Sleigh Johnson: The Typing of the Pneumococcus and its Clinical Value.

3.15 p.m. Dr. Harold Davies: The Use of Basal Metabolic Rate Apparatus.

Tuesday, February 2:

10 a.m. Mr. W. H. C. Romanis: Surgery of the Lung.

11.15 a.m. Dr. W. Burton Wood: Treatment of Infections of the Pleura.

2 p.m. Dr. S. Roodhouse Gloyne: The Cytology of Sputum; Technique and Interpretation.

Wednesday, February 3:

10.30 a.m. Dr. H. V. Morlock: The Pulmonary Abscess.

2 p.m. Dr. E. H. Hudson: Paracentesis Thoracis.

3.15 p.m. Dr. Franklin Wood: Accessory Methods of Chest Radiology.

Thursday, February 4:

10 a.m. Mr. D. F. A. Neilson : Diagnosis and Treatment of Tuberculous Lesions of the Upper Respiratory Tract.

11.15 a.m. Dr. G. Hochschild: Some Recent Improvements in Chest Anæsthesia Apparatus.

2 p.m. Dr. N. Lloyd Rusby: Dermoid Cysts of Thorax; their Differential Diagnosis and Complications.

Friday, February 5:

10 a.m. Mr. H. Sellors: Surgery of the Pleura.

11.15 a.m. Dr. F. G. Chandler: Thoracoscopy.

2 p.m. Dr. S. Roodhouse Gloyne: The Bacteriology of Chronic Pulmonary Suppuration.

Saturday, February 6:

10 a.m. Dr. H. V. Morlock and Dr. E. H. Hudson: The Bronchoscopy Clinic.

Short Laboratory Demonstrations will be held each morning at 12.30 a.m.

Facilities will be afforded for seeing X-rays, ward cases and the work of the various departments.

For particulars apply: Dr. W. Brand, Hon. Sec. for Post-Graduate Courses, Joint Tuberculosis Council, 8, Christchurch Place, Epsom, Surrey.

REVEWS OF NEW BOOKS

Modern Treatment of Diseases of the Respiratory System. By A. LISLE PUNCH, M.B., M.R.C.P., Senior Physician Royal Northern Hospital and Physician to the Brompton Hospital for Consumption and Diseases of the Chest; and F. A. KNOTT, M.D., M.R.C.P. Lond., Director of the Bacteriological Department, Guy's Hospital, Reader in Pathology, University of London. J. and A. Churchill, London, 1936. Pp. 295, with 96 plates, 31 text figures. Price 15s.

Many medical textbooks deal largely with the cause, pathology, signs and theories of disease, but devote only a few lines to its treatment. The general practitioner who wants to know what to do for his patient will find this practical book of real value.

The chapter on intrathoracic tumours describes the appropriate treatment for each type of growth. The authors are of opinion that removal by surgical operation is best, but is very rarely possible in malignant cases. Treatment by X-ray they regard as disappointing, although temporary improvement may occur in some types of tumour, notably sarcoma. For carcinoma it is useless. With regard to radium, they state that at present results are not good, but it may cause some local destruction of the growth.

The modern treatment of pneumonia is fully discussed. Artificial pneumothorax, they say, is useful to relieve severe pain in pleurisy, but has no beneficial influence on the pneumonia itself. The treatment of cardiac failure in pneumonia, and especially the use of digitalis, the indications for venesection, blood transfusion, the value of the oxygen tent, and the specific serum treatment are all described in detail.

Four chapters are devoted to the treatment of tuberculosis, the first of these dealing with the initial treatment and artificial pneumothorax, with a detailed account of the technique and apparatus required for inducing a pneumothorax. In the next chapter sanatorium treatment is discussed, and the reader will find what really is meant by sanatorium treatment. Sanocrysin, calcium and tuberculin are also considered in this chapter.

The various forms of surgical treatment and the management of advanced and acute cases are then discussed.

We can recommend this book to all who are interested in the treatment of intrathoracic disease, and especially to those who wish to undertake treatment themselves. Minute details are given of all procedures, so that anyone wishing to perform gas replacement or wash out the pleural cavity or any similar treatment will find a full description of the technique with illustrations of the necessary apparatus.

The work is well produced and illustrated and concludes with a useful index.

Prevention and Treatment of Tuberculosis in the Administrative County of Lancashire. A report of the Central Tuberculosis Officer of the Lancashire County Council for the year 1935.

Pulmonary tuberculosis has decreased by 52 per cent. and non-pulmonary tuberculosis by nearly 70 per cent. during the last twenty years in this county, and the Central Tuberculosis Officer, Dr. Lissant Cox, states that whilst new methods of treatment have been applied with success on individuals, the best results for the community result from careful and detailed measures of prevention, or, in other words, dealing with the adult positive sputum case.

The report deals with after-histories for five years of 2,734 cases, and besides the usual tables showing incidence and mortality, classification of new patients, details of notification and the dispensary organisation are described.

Treatment by light and by institutional methods are described, and a description of infra-red radiation treatment by Dr. G. Barker Charnock is of special interest. Dr. F. C. S. Bradbury contributes a valuable paper on the standardisation of the sedimentation test.

Reports from institutions and dispensaries in the different areas are included, and the whole report lives up to the standard of previous annual reports from this model organisation.

Tissue Immunity. By REUBEN L. KAHN, M.S., D.Sc., University of Michigan. Baillière, Tindall and Cox, London, 1936. Pp. 707. Price 34s.

This is a study of tissue reactions. The author states that one of the most fundamental differences between the non-immune and the immune states is that in the former the body is incapable of anchoring and localising antigenic agents. Thus in tuberculosis the result of the primary infection in diffusion of the bacilli from the site of entry and the course of the clinical disease depends largely upon the extent of this diffusion before the body becomes allergic. The period of antibody formation in the incubation period and a small dose of antigen will often produce a greater antibody reaction than will a large one. This may be due to the fact that a large dose of antigen from the tissues and antibodies are known to appear as antigen disappears. This may explain why in a case of very active tuberculosis with a large quantity of antigen in the blood the serum reaction test is likely to be negative.

The difference between bacterial protein and non-bacterial protein is stressed. In protein-immunised animals tissue necrosis will occur only if the animal is in a high state of immunity, whereas tissue necrosis occurs with mild immunity to bacterial protein.

A large number of experiments are carefully described, and their clinical significance is discussed in a summary at the end of each chapter. Much light is thrown on infections and the course and reactions in infectious disease, and theory is supported by experimental evidence.

There is a useful bibliography, and the book is well produced and arranged and can be warmly recommended.

Artificial Pneumothorax. By F. J. BENTLEY, M.D. Durh., M.R.C.P. Lond., Div. Medical Officer, London County Council. Medical Research Council, 1936. Special Report Series, No. 215.

Fourteen years have passed since the Medical Research Council published their first report on artificial pneumothorax by MacNalty and Burrell. The author of the present report has the general impression that statistical experience is not yet sufficient to substantiate the favourable view taken in 1922, but that optimism is widespread.

In the first portion of the report the author reviews the English and foreign literature of the subject, and the second and larger portion deals with the experience of the London County Council, based on 677 new cases. The report is carefully thought out and presented, and the author deserves the greatest praise for his treatment of this difficult subject.

Difficulties in this work are chiefly due to the impossibility of getting comparable controls. Again, the course of tuberculosis is so different at different age periods and in the sexes that to be accurate cases must be subdivided according to age and sex. The type of disease, the social position and temperament of the patient also affect prognosis and necessitate further subdivisions, and the result is that in each group or subdivision the number of cases is too small to be of real statistical value.

The author has, however, managed to produce some interesting figures and arrive at certain conclusions. He finds that in both sexes pneumothorax gave good results during the age period twenty-five to thirty, but that whilst twenty to twenty-five is the best age period for pneumothorax in males, it gives disappointing results in females. He also found that with results of the 677 cases there was a gain in lives of 129·53 at the end of three years—that is to say, an increase in the number alive over the expected number amongst those conservatively treated of 19·1 per cent.

He finds that the most important factor in obtaining good results is the absence of disease in the better lung, and the second in importance is that the collapse should be complete.

The report goes to show that taken as a whole the survival rate in cases of pulmonary tuberculosis is definitely increased by artificial pneumothorax treatment.

Tuberculosis, Cancer, and Zinc. By D. B. CRUICKSHANK, L.R.C.P. and S., L.D.S.(Edin.), D.P.H.(Camb.), Member of Research Staff, Papworth Village Settlement.

This little book provides still further evidence of the activities of Papworth Village Settlement.

It starts with a summary, and the argument is based on the assumption that in tuberculosis there is a defence mechanism analogous to the bacteriophage defence in intestinal infections with the typhoid group of organisms, and that this particular phage is itself pathogenic to man. The pathogenic manifestation of this phage is cancer.

The first chapter is devoted to a full description of the metabolism, sources and functions of zinc and its distribution in the body. The second

chapter deals with the view that zinc deficiency is associated with tuberculosis, and the third that its excess is found with cancer.

It is stated that the sum of the cancer and tuberculosis death-rates has remained constant for many years. When one increases, the other falls. It is true that the death-rate from tuberculosis has fallen, and that from cancer risen in the last half-century, but it is not clear that there is any definite relationship between the two. Thus per million living in England and Wales the death-rate in 1900 was 1,904 for tuberculosis and 830 for cancer, a total of 2,734. In 1930 the corresponding figures were 872 and 1,003, a total of 1,875, and in 1935 they were 687 and 1,001, a total of 1,688.

The book, however, is one of considerable interest, and the theories are well discussed. There is an introduction by Sir. Pendrill Varrier-Jones, who stresses the fact that the book deals with an hypothesis which it was decided to publish for consideration of others before awaiting scientific proof.

We have received a copy of the seventeenth Annual Report of the Ministry of Health.

Part A contains eight pages dealing with general matters such as legislation and finance. Part B consists of nine chapters, and contains a mass of information relating to public health, including such a variety of subjects as hop pickers, administration of boat and canal Acts, imported foods, housing, public baths, fire protection, and precautions against explosions in operating theatres.

In Chapter III there is an account of tuberculosis. Schemes of local authorities, facilities for sanatorium treatment, the village settlement, and statistics of notification and a census of tuberculous population and deaths will be found.

Part C is concerend with National Health Insurance and Part D with the Welsh Board of Health.

The report concludes with appendices and is a valuable record of the country's health.

Papworth Research Bulletin.

The Bulletin for 1936 contains many interesting papers and bears testimony to the valuable research work which is being done at Papworth in addition to the colonisation employment and medical and surgical activities of the village settlement.

One of the most interesting papers deals with the spontaneous healing of cavities. Much has been written on this subject, but the modern tendency to apply mechanical and often drastic surgical methods as soon as a cavity appears may endanger the life of a patient who would get perfectly well if left alone. This tendency is largely due to the lack of knowledge that spontaneous healing can and usually does occur, and it is most important to record cases which emphasise this fact.

Amongst many other interesting papers is one on reinfection. Dr. Pagel has succeeded in reproducing early pulmonary tuberculosis of the adult type by exogenous and endogenous reinfection.

The report is illustrated by many radiograms and reproductions of pathological specimens well produced on art paper.